Telephony.

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Seventh Annual Convention of the Independent Telephone Association of the United States of America.

The seventh annual convention of the Independent Telephone Association of the United States of America will be held at the Auditorium Hotel, Chicago, on June 24 and 25, 1903, and promises to be one of the most successful and important in the history of the organization. The advisory board of the organization used good judgment in selecting Chicago as the next meeting place of the association. This publication has always held that Chicago is the logical city for telephone conventions, as it is the center of the Independent industry and affords every opportunity for inspecting all that is new and modern in the art. The general committee appointed by the advisory board having the convention arrangements in charge is composed of J. G. Ihmsen, chairman; C. W. Steger, A. E. Barker, H. D. Critchfield, Henry Shafer, W. Norman Collins, John R. Dare and H. B. McMeal. Mr. Ihmsen, chairman of the general committee, has appointed the following auxiliary committees:

Finance—H. B. McMeal, chairman; Chas. Ffrench, W. Norman Collins, John R. Dare, W. H. Graffis, J. V. S. Church and W. H. McDonough.

Entertainment—J. G. Ihmsen, chairman; C. W. Steger, James Wolf, A. E. Barker and Henry Shafer.

Reception—P. C. Burns, chairman; Milo G. Kellogg, Alfred Stromberg, E. B. Overshiner, George A. Briggs, W. E. Doolittle, Charles H. North, Charles L. Burlingham, Frank G. Jones, H. D. Critchfield and Charles W. Farr.

The program for the two days' session is as follows:

June 24, 2 p. m.

Address of welcome, by Hon. Carter H. Harrison, mayor of Chicago.

Response, by Hon. S. P. Sheerin of Indianapolis, Ind.

Annual address of President James M. Thomas.

Roll call of states, ten-minute reports.

Advantages of Association, by Hon. C. E. Hull of Salem, Ill., president Interstate Independent Telephone Association.

The Telephone and the Technical School, by J. C. Kelsey, professor of telephony, Purdue University, LaFayette, Ind.

Modern Exchange Construction, by W. H. Johnson, general superintendent Frontier Telephone Company, Buffalo.

Independent Telephone Development in the South, by C. E. Stinson, president Memphis Telephone Company, Memphis, Tenn.

Western Telephone Development, by J. S. Bellamy, Knoxville, Iowa.

6. p. m.—Concert in Auditorium Hotel.

8 p. m.—Special train to Sans Souci Park, program of entertainment there to be given later.

June 25, 10 a. m.

Patent Litigation, committee report, by Hon. Hugh Dougherty of Bluffton, Ind., chairman.

Telephone Discipline, by C. E. Tarte, general manager Citizens' Telephone Company, Grand Rapids, Mich.

Eastern Telephone Development, by F. A. Dennrest, general superintendent Interstate Telegraph and Telephone Company, Trenton, N. J.

Present and Future, by Frank L. Beam of Columbus, Ohio.

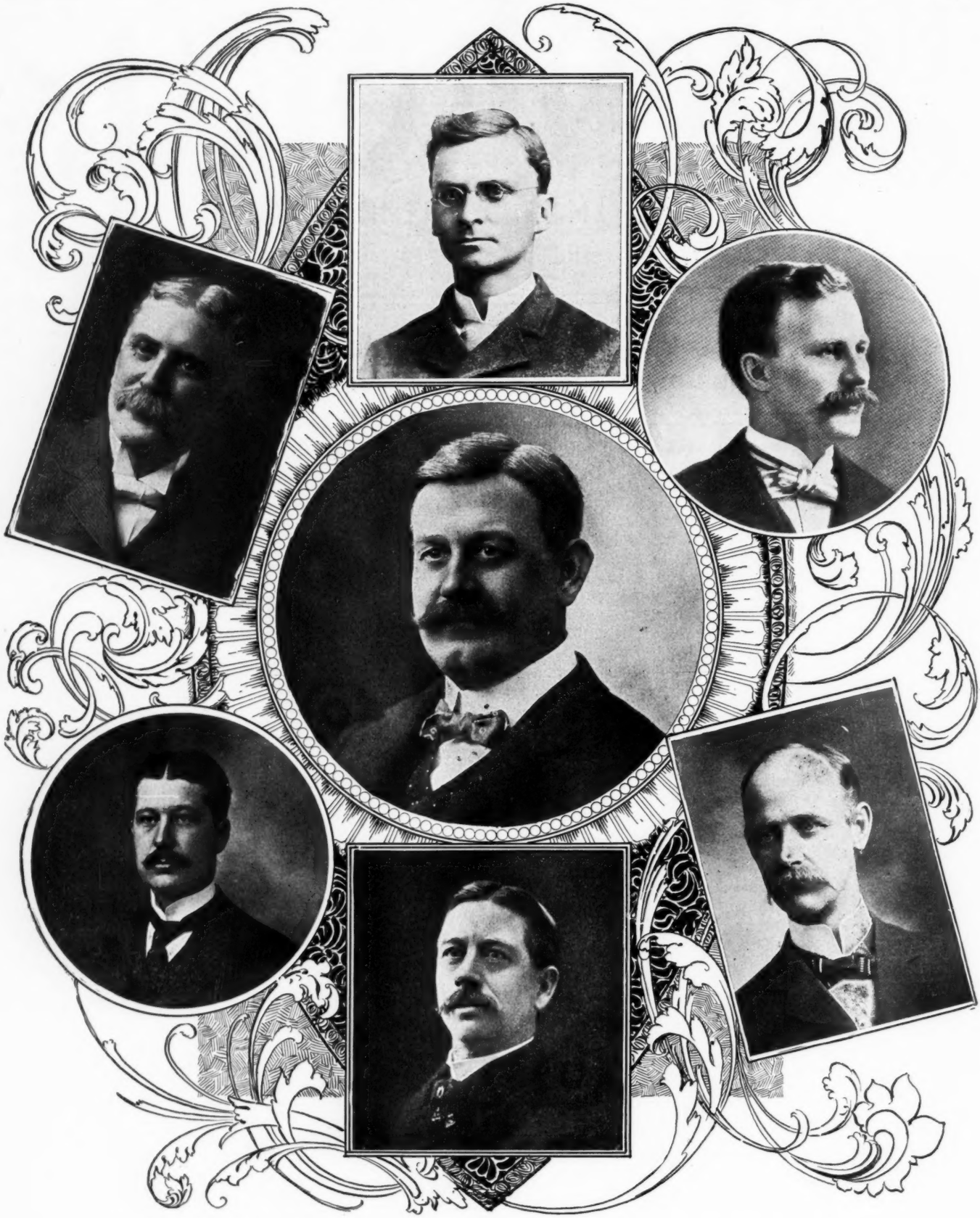
The important feature of the convention will be the report of the patent litigation committee, which will be a review of the work done by the association in defending the patent suits brought against Independent interests by the Bell company. The entertainment, which will be tendered by the telephone manufacturers, supply houses, kindred interests and the telephone and electrical press, will be varied and in keeping with Chicago's reputation for hospitality. It is the duty of Independent telephone men to attend the various conventions which are gotten up very largely for their advancement and good, and it is safe to assume the coming convention will be a large and enthusiastic one and that much good will result therefrom.

Application has been made for special rates on all railroads and those attending should apply to local ticket agent for certificate entitling them to the one-third fare returning. The Auditorium Hotel has made special rates for the accommodation of the visiting telephone men.

The officers and advisory board of the Independent Telephone Association of the United States of America is as follows:

Officers—James M. Thomas, president, New York, N. Y.; Hugh Dougherty, first vice-president, Bluffton, Ind.; C. E. Stinson, second vice-president, Rochester, N. Y.; W. H. Durin, third vice-president, Cedar Rapids, Iowa; Jos. B. Ware, secretary and treasurer, Detroit, Mich.; C. E. Wilson, first assistant secretary, Philadelphia, Pa.; Ed. L. Barber, second assistant secretary, Wauseon, Ohio; T. B. Lee, third assistant secretary, Pittsburg, Pa.

Advisory board—James M. Thomas, New York, N. Y.; Hugh Dougherty, Bluffton, Ind.; H. D. Critchfield, Mt. Vernon, Ohio; E. B. Fisher, Grand Rapids, Mich.; S. E. Wayland, Scranton, Pa.; S. P. Sheerin, Indianapolis, Ind.; E. E. Webster, Minneapolis, Minn.; H. C. Young, Columbia, Pa.

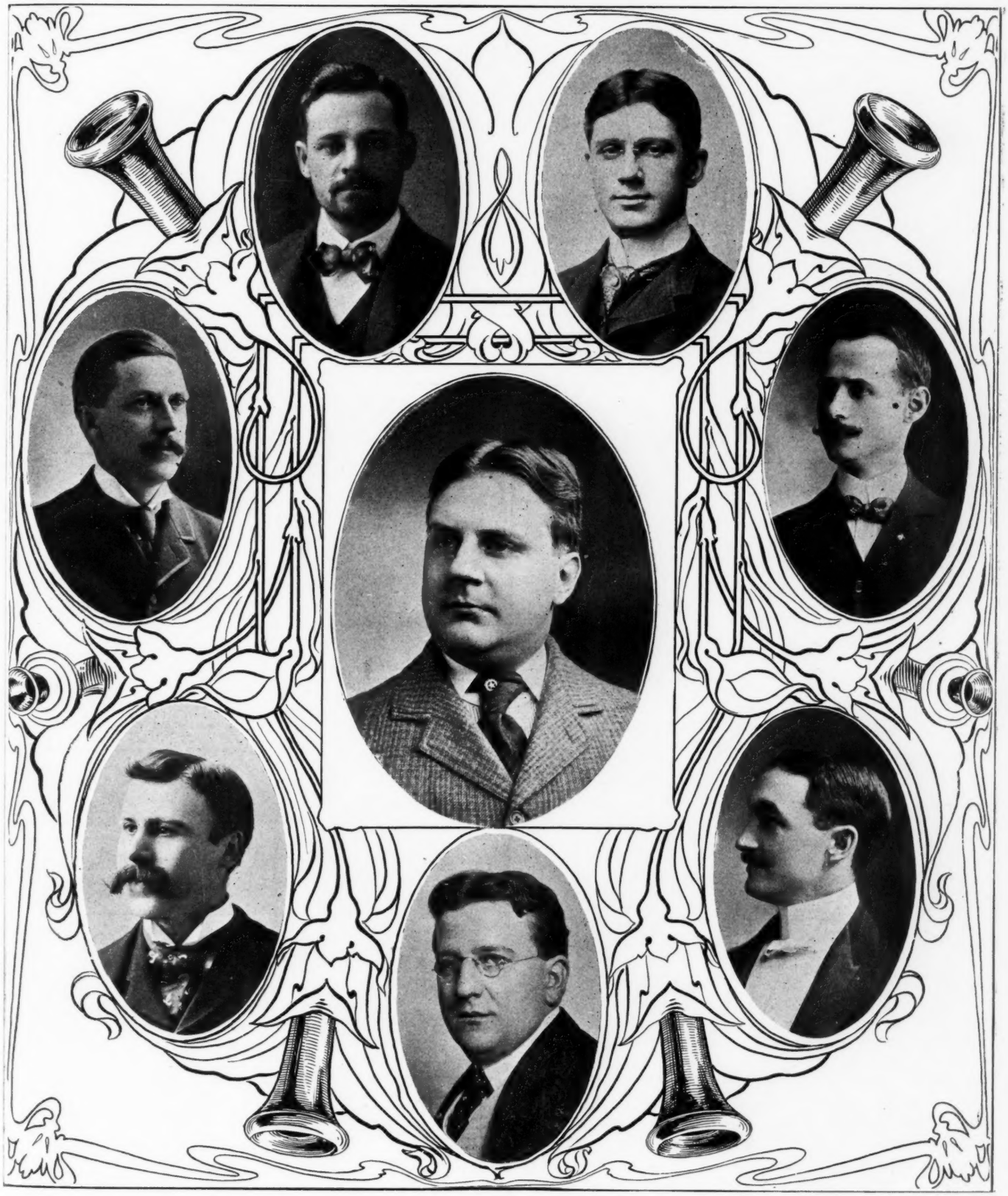


OFFICERS INDEPENDENT TELEPHONE ASSOCIATION OF THE UNITED STATES OF AMERICA.

Hugh Dougherty, 1st Vice-Pres.
Chas. E. Wilson, 1st Asst. Sec.

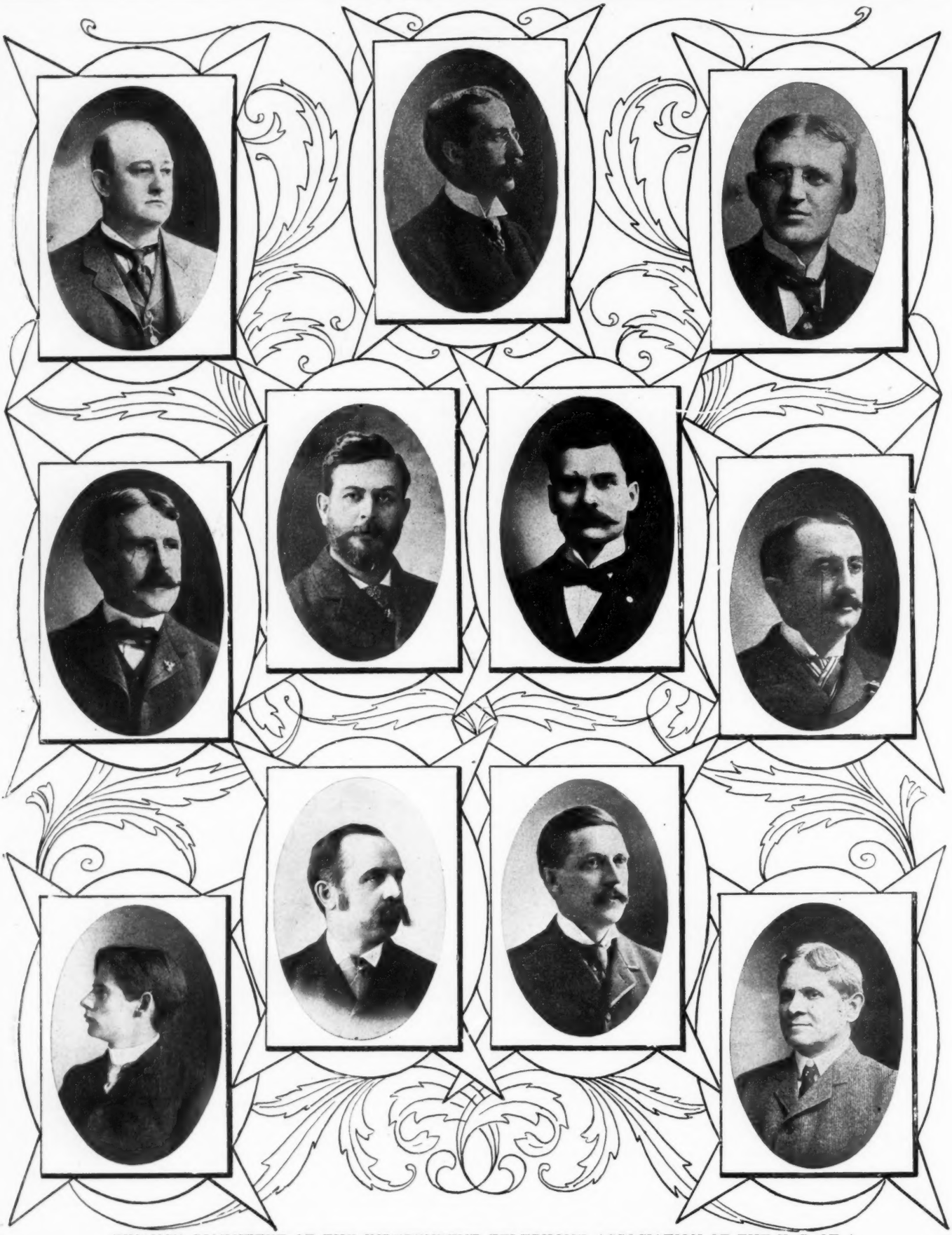
J. B. Ware, Sec. and Treas.
James M. Thomas, President.
C. E. Stinson, 2nd Vice-Pres.

E. L. Barber, 2nd Asst. Sec.
W. H. Durin, 3rd Vice-Pres.



GENERAL COMMITTEE, INDEPENDENT TELEPHONE ASSOCIATION OF THE U. S. OF A.

H. D. Critchfield.
W. Norman Collins.
C. W. Stiger.
J. G. Ihmsen, Chairman.
H. B. McMeal.
A. E. Barker.
Henry Shafer.
J. R. Dare.



FINANCE COMMITTEE OF THE INDEPENDENT TELEPHONE ASSOCIATION OF THE U. S. OF A.

E. B. Overshiner. P. C. Burns, chairman. G. A. Briggs.
W. E. Doolittle. C. H. North. A. Stromberg. C. L. Burlingham.
F. G. Jones. Milo G. Kellogg. H. D. Critchfield. C. W. Farr.

HARDSHIPS OF TELEPHONE LINEMEN.

It goes without saying that perhaps the most dangerous of all occupations and the one which has more accident contingencies arising from pursuit of its calling is that of the telephone or telegraph lineman. He it is who goes forth, after bidding wife and family good-bye, to enter upon his day's occupation, knowing that his work that day will take him into a district that perhaps has seen more than one life sacrificed by coming in contact with a "hot" wire, or perhaps one whose insulation was defective to the extent that a leak made it the most dangerous and deadly of electric wires. But "familiarity breeds contempt," and he goes about his work within a few inches of a hot wire or strand cable carrying from 40,000 to 50,000 volts, with no thought of the continual dangers that are besetting him. To touch one of the afore-mentioned wires may mean instant death, although not necessarily so, as recently it is stated that a lineman received through his body the larger share of a voltage of 40,000 and lived to tell about it; but his case was one in a million.

The work of any lineman is hazardous in the extreme, but work done in the winter time in the mountains is the most dangerous of all. For instance, the care of the telephone lines crossing the Sierra Nevada mountains; aside from the ordinary work, the lineman must undergo daily the rigors of zero weather in the high altitudes, and there are many instances cited where men have suffered from snow blindness, been partly frozen at times and have lost their way in the fierce snow storms, almost perishing from starvation; and it is recorded that there have been cases of men being swept away by snow slides and never heard of again. It is claimed by those who are familiar with mountain line construction and repairing that the latter instance is of frequent occurrence and that there is absolutely no way of forecasting them or of evading them when they come.

Telephone repair men are subjected to even greater dangers than the telegraph or railroad linemen, for the reason that the latter usually follow the railroads, and therefore much of the way have the protection of snow sheds. The telephone linemen, however, are out in the exposed open much of the time, on the sheer sides of mountains, where a snow slide may sweep them out of existence at any moment.

To be a successful lineman one must have the essential qualities of muscle, nerve and a thorough knowledge of the business, besides an accurate knowledge of the mountains and their dangers. Fear or fatigue must be unknown to him, and his one care must be at all times and despite the fearfully cold temperature and thousand and one dangers which continually interfere with his duties to keep the lines open and in working order. If tests show that a line is down he must traverse weary, painful miles on his snowshoes, locate the break, repair it and continue on his inspection until he is relieved by another man. Often it is necessary for him to telephone perhaps miles for assistance, and in that case he is compelled to await the coming of the men sent out to aid him, and must continually keep in touch with them.

According to a San Francisco daily, there is a man now living in that city who has been through all the rigors of mountain work, and was forced to leave his duties on account of the terrible strain, although paid high wages by the telephone company employing him. By name John Gagan, he has but recently returned from his duties in the high altitudes of the mountains, and is carrying with him marks upon his person caused from his terrible experiences that will last him to the grave. He has endured every hardship that men in the business can suffer, and it is to his credit that it is said he has never failed in an undertaking or lost his nerve in any of the hair-breadth escapes he has undergone. This is, under the circumstances, a remarkable record.

To avoid snow blindness he continually wore smoked glasses, and he seemed utterly impervious to any kind of danger, callous to any risks and wholly indifferent to fatigue. He wore the nine-foot American snowshoes, which weigh about one and one-half pounds apiece, and upon these he has been forced for a period of one month to daily make his entire circuit of fourteen miles. Rocks and the sides of the mountains would be covered with snow, and every step might mean a fall of hundreds of feet to the yawning, rocky crags below, with sure death the prospect of such a fall. Not infrequently he received shocks, knocking him off from the tops of poles to the ground below, nothing but the thick covering of snow saving him from serious injury. It is stated that in one week he fell from the tops of poles three times, and he never thought it of enough consequence to say anything about it, much less to report it to the company.

He has frequently received shocks from hot wires containing 2,000 volts, but he never received serious injury. At one time he fell over a sixty-five-foot embankment, but luckily alighted on a pile of snow about ten feet deep, suffering but the inconvenience caused from lack of breath for a few minutes.

There is one thing that the city lineman has to contend with that is one of the greatest of his dreads—namely, the acts of boys and others in shooting off or otherwise destroying the glass insulators of telephone or telegraph lines. Many a lineman has gone to his death because of some such act upon the part of a thoughtless person; sometimes the leak caused will precipitate a veritable maelstrom of high-power currents through a lineman's body, and he will fall to the ground a lifeless mass, or will fall over into the network of wires and burn until his body is rescued by his comrades.

So serious has this become that strict laws have been passed in the East bearing on tampering in any manner with insulators.

MEETING OF THE OHIO INDEPENDENT TELEPHONE TRAFFIC ASSOCIATION.

The first meeting of the Ohio Independent Traffic Association was held at Columbus, Ohio, on May 12, 13 and 14. About fifty companies were represented at the meeting.

The first day's session was devoted to regular order of business, including the report of President W. Gilbert Thompson, A. V. Hageman, treasurer, and H. H. Robinson, chairman of the executive committee.

The papers presented were brief and to the point, and they were freely discussed. They were as follows: "Reduction of Expense in Exchange Operation," F. L. V. Turner, general manager Cuyahoga Telephone Company, Cleveland, Ohio; "The Farmer Line Problem," O. F. French, assistant general manager Federal Telephone Company, Cleveland, Ohio; "Development of the Small Exchange," Howard Schwartz, general manager Star Telephone Company, Ashland, Ohio; "How to Make County Toll Line System Profitable," M. M. Herron, general manager Millersburg, Wooster & Orville Telephone Company, Millersburg, Ohio; "Economy in Long-Distance Operation," H. H. Robinson, general manager United States Telephone Company, Cleveland, Ohio; "The Value of Standardizing," H. C. Devin, general manager Mt. Vernon Telephone Company, Mt. Vernon, Ohio.

The following directors were elected for the ensuing year: W. G. Thompson, Lebanon; Jerome Penn, Washington C. H.; W. J. Crawfley, Salem; Eugene E. Knox, Portsmouth; H. H. Robinson, Cleveland; C. E. Yoder, Bellefontaine; J. G. Palmer, Conneaut; A. V. Hageman, Lorain, and A. H. Doudna, Bridgeport.

Los Angeles Exchange—Home Telephone and Telegraph Company.

By William J. Gunn.

With that characteristic push and energy for which the west is noted, and yet with such a degree of quietness that few people not in close touch with the work realized the significance of what was going on, the Empire Construction Company of Toledo, Ohio, has been building during the past year a telephone plant for the Home Telephone and Telegraph Company of Los Angeles, which is unique in many respects, and certainly not surpassed in point of excellence by any large or small telephone exchange system in the world.

The plant is unique in that it is believed to have the largest present equipment of any straight multiple board in the United States, and in that there is but one other board having the same ultimate capacity; it is unique in that a record was made in point of time in pushing the work from its bare conception to a completely operative condition; it is unique in that the building in which the central office is housed is one of unusual beauty of design, and stability in structure, and finally it is unique in that many novel methods of construction and arrangement were used in both the outside and inside work.

The Home Telephone and Telegraph Company is to be congratulated on having such a construction company to perform this work as the Empire company, and this latter company is to be congratulated on having a personnel of such unusual merit as is found in the men who have been most active in this work. The greatest credit is due to Mr. F. F. Graves, the general manager of the Empire company, and to his able assistants, Mr. John Von Lieu, the secretary of the company; Mr. Charles L. Zahm, the company's engineer, and Mr. F. M. Wachter, its general superintendent. These gentlemen, all experienced in their line of work, have gathered about them a force of competent assistants.

The personnel of the Home Telephone and Telegraph Company, which is to own and operate the plant, is as follows: Col. J. M. C. Marble, president; A. B. Cass, vice president; F. F. Graves, secretary and treasurer; these gentlemen, together with Thomas W. Phillips, Herman W. Helman, W. C. Patterson and Oscar A. Trippett, forming the board of directors.

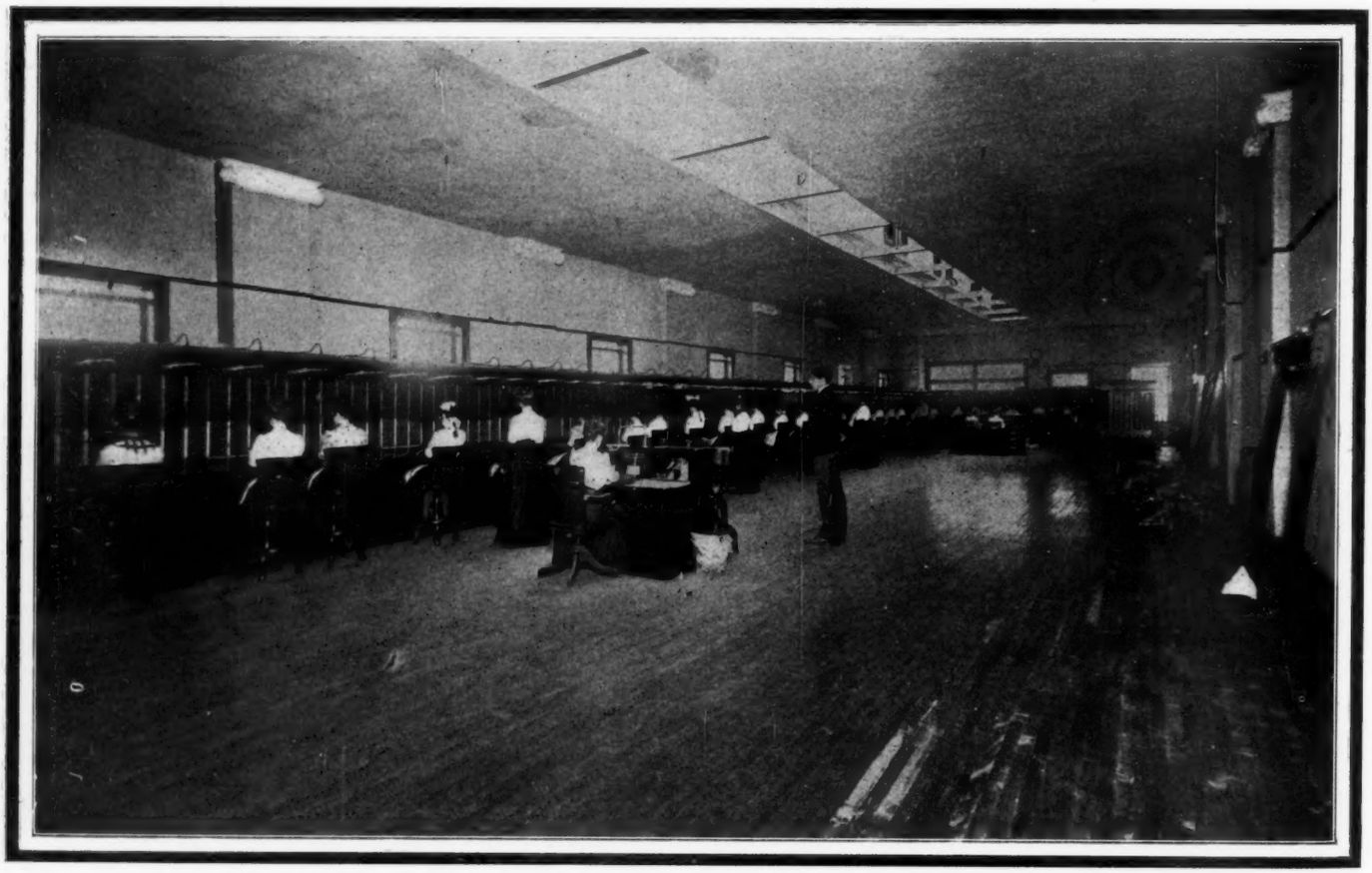


FIG. 12. MAIN OPERATING ROOM HOME TELEPHONE AND TELEGRAPH COMPANY, LOS ANGELES, CAL.

As no building could be found in which the members of the two companies were willing to house their central office equipment, it was decided to erect a building especially for this purpose, and further, that the building so erected should be used for the purpose of the telephone company exclusively, and not as a general office building as well, as is so often done. The building is located on Hill street, between Second and Third, at a point very close to the true center of distribution of the city, and is a three-story structure, strictly fire proof in all respects. No picture of this building is available at the present time, but it is of sandstone

of modern design, the general appearance at once conveying the impressions of stability and beauty.

The basement of the building contains a large room for storage, besides the usual heating and ventilating apparatus, and other equipments found in a modern building of this size. The first floor is devoted to general offices, and reception rooms of the Home company, and in this floor particularly some of the most beautiful features of the building itself are to be found.

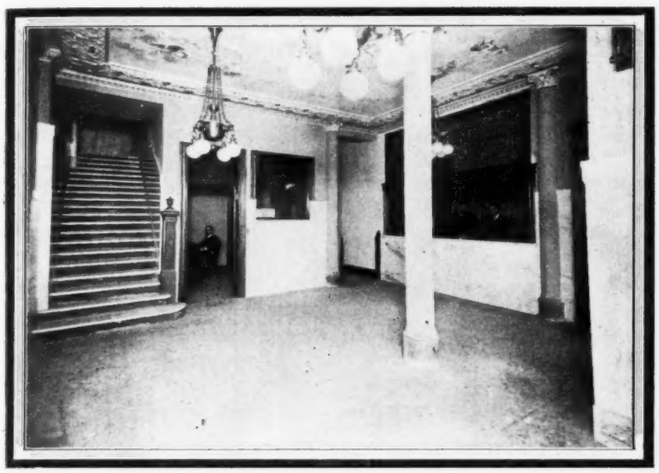


FIG. 1. FOYER—SHOWING CASHIER'S OFFICE.

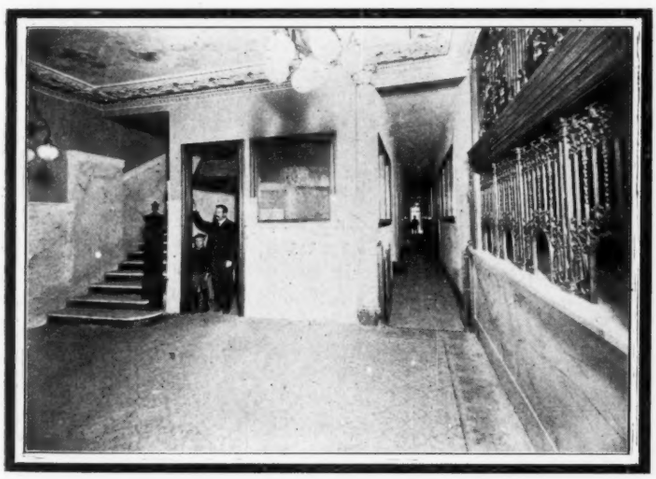


FIG. 2. FOYER—MAIN FLOOR.

FIG. 3. CASHIER'S OFFICE.

The first impression one obtains on entering the foyer of the building on the main floor is of the general beauty and elegance of the fittings and decorations, which, it is believed, surpass those of any telephone building in this country. More careful inspection will show, however, that this beau-

FIG. 4. GENERAL MANAGER'S OFFICE.

FIG. 5. OPERATORS' LOUNGING ROOM.

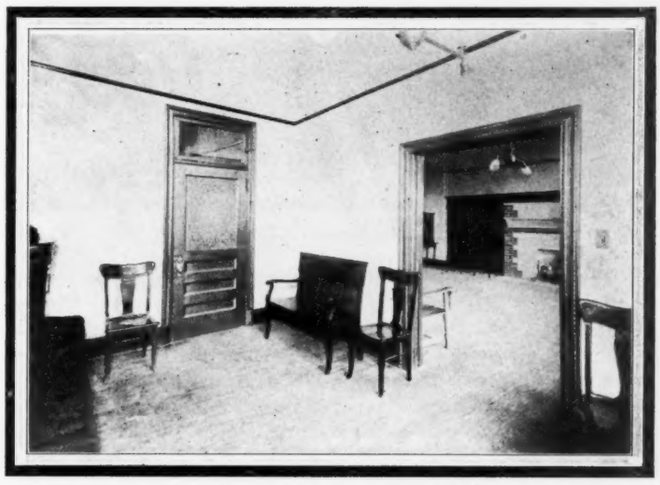


FIG. 6. HOSPITAL.

ty is not merely superficial, and that after all the charming effects have not been obtained at a sacrifice to utility and general convenience. Two views of the foyer are shown in Figs. 1 and 2, in both of which the marble stairway leading to the second floor is shown on the left. At the right of these figures the windows of the cashier's office are shown, through which most of the business between the company and its clientele is transacted. An idea of the general arrangement of the building may be obtained from Fig. 2, the various offices of the officials of the company being arranged on the right and left-hand sides of the long hallway here shown. The decorations in this foyer are particularly noticeable, and the citizens of Los Angeles are indeed fortunate in having such an attractive place in which to transact their business with the company.

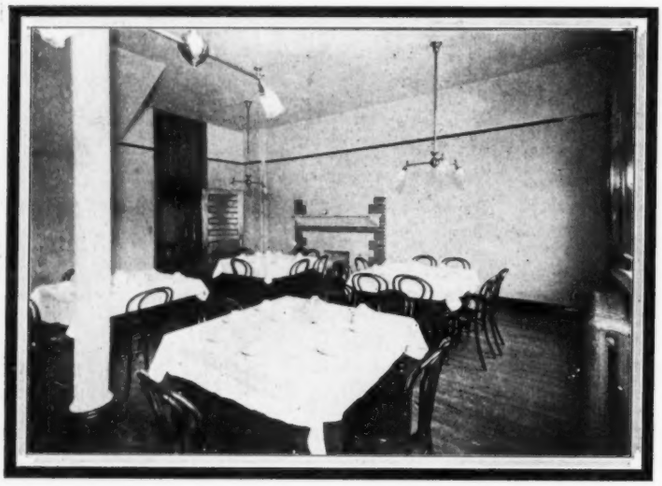


FIG. 7. OPERATORS' LUNCH ROOM.

In Fig. 3 is shown a view of the cashier's office, the grill windows leading into the foyer being shown on the left.

In Fig. 4 is shown one corner of the general manager's office, the three gentlemen in this picture being Mr. Graves on the right, Mr. Von Lieu in the center and Mr. Wachter on the left.

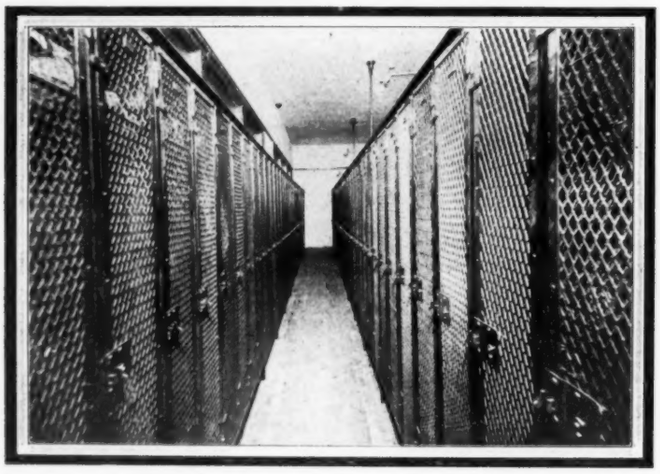


FIG. 8. OPERATORS' LOCKER ROOM.

Coming now to the arrangements made for the convenience and comfort of the operators, it will be seen that the company has adopted the same broad policy that has characterized its work in general, and which policy is finding more and more favor in the management of modern plants. In Fig. 5 is shown the lounging room in the front on the second floor, than which it is believed there is no more beautiful room for similar purpose in the United States. The large windows, combined with the well-known sunshine of the southern California climate, serve, together with the tasty furniture and open fireplace, to make this room particularly attractive.

In Fig. 6 is shown the hospital room for the operators; this, together with the lounging room and other rooms for the convenience of the operators, being placed in charge of an experienced and trained nurse.

Fig. 7 shows a view of the dining room, where light lunch is served to the operators, after the manner of modern exchanges.

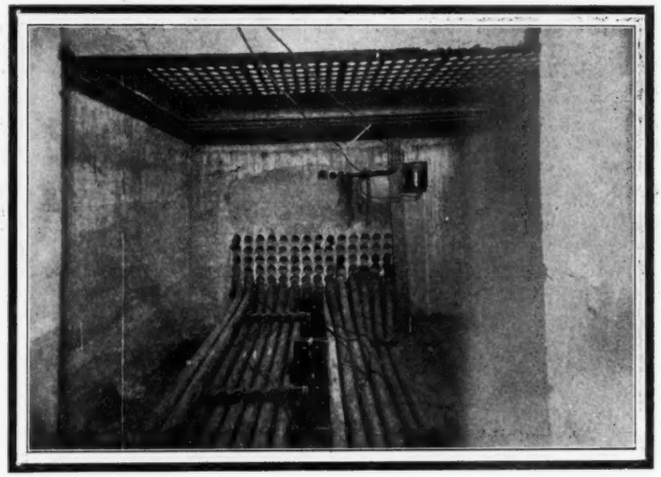


FIG. 9. CABLE VAULT.

In Fig. 8 is shown one aisle of the locker room for the operators, and in this it will be seen that beauty has perhaps been sacrificed to utility and to proper sanitary conditions. The lockers are of expanded metal, which type is becoming well recognized as far superior to the old closed wooden lockers, in that they are always well ventilated, always open for ready inspection, and easily cleansed when necessary.

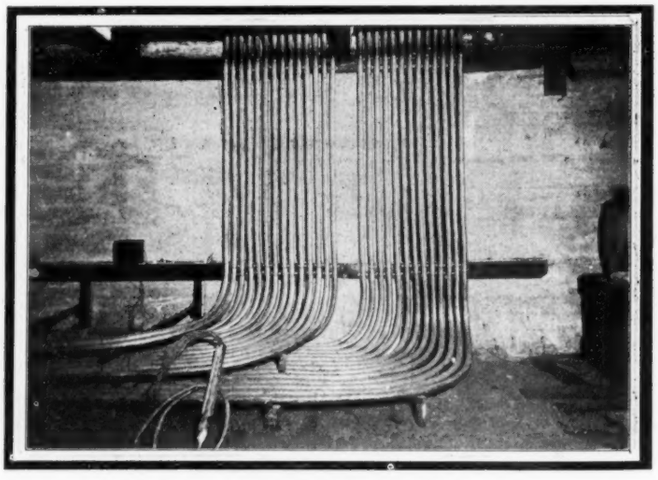


FIG. 10. ENTRANCE TO CABLE ROOM.

Another feature, designed for the convenience and general welfare of the operators, and made possible by California's unsurpassed climate, is a roof garden, occupying the entire roof of the building, accesible at all times to the operating force.

Coming now to the electrical and mechanical equipment of the exchange building, it may be said at the start that the entire equipment was furnished by the Kellogg Switch-

board and Supply Company of Chicago, and that the arrangement of this part of the plant and its engineering features are the joint work of Mr. Zahm and the corps of engineers of the Kellogg company.

Fig. 9 shows one side of the cable vault arranged under the sidewalk in front of the building, showing clearly the arrangement of the cable racks and the cables leading from the street ducts. These cables are arranged on iron racks specially designed by Mr. Zahm, the rack permitting of extension upward to any desired capacity. The present cables

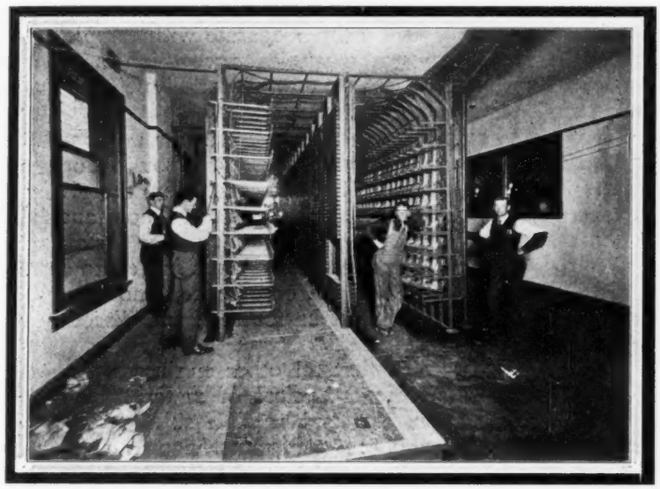


FIG. 11. TERMINAL ROOM.

are three layers deep. In Fig. 10 is shown a view of the street cables, taken about thirty feet back of the view shown in Fig. 9, this latter view giving a clear idea of the arrangement of the cables in layers, and of the way in which they turn in order to reach the main distributing frame on the second floor above.

The telephone engineers throughout the country can well afford to study Mr. Zahm's arrangement for bringing in his

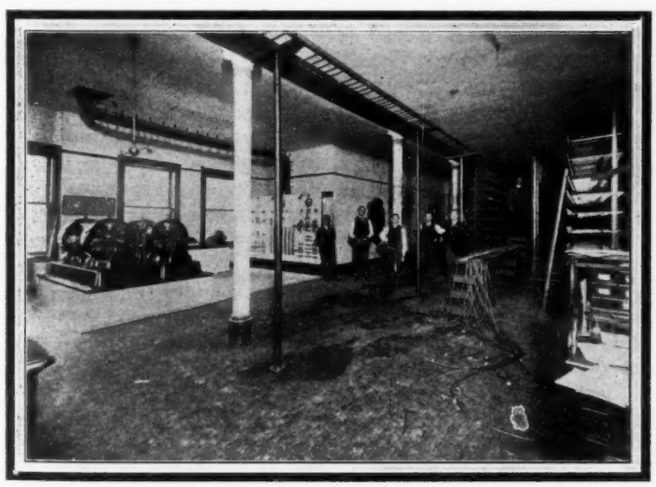


FIG. 13. POWER PLANT AND TERMINAL ROOM.

street cables. It may be said by some that there is no particular reason why work of this class should be made to look pretty, but on the other hand, it is usually true that neatness in work and arrangement has many advantages besides those of affording a pleasant impression to the eye.

The street cables are led up to the second floor through a narrow shaft, and turned into a horizontal position over a quarter round beam having grooves adapted to fit exactly the external diameter of the cable. The cables are three hundred pair, and as the connectors on the line side of the main distributing frame are each adapted for one hundred and sixty pairs, each cable is split in half and fanned out so that each cable is distributed over two vertical strips. The main distributing frame is shown in the left of Fig. 11, both line and switchboard terminals being on the left hand side of this frame, and arranged alternately, all jumper wires being carried in the runways on the right hand side of the frame, as is clearly shown in this picture. The middle frame in this view is the relay rack, on which the line and cut-off relays are carried while the frame on the

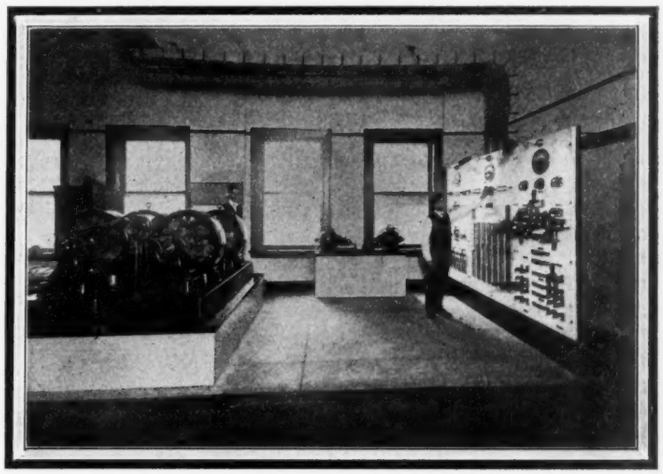


FIG. 14. POWER PLANT AND POWER BOARD.

right is the intermediate distributing frame for equalizing the load on the various operators' positions. The cabling between these frames and the main switchboard are carried on iron racks and runways above the three frames, and upon an examination of this work, as shown in this and the following pictures, it will be seen that little is left to be desired in point of neatness in carrying out the work.

After passing over the intermediate distributing frame,

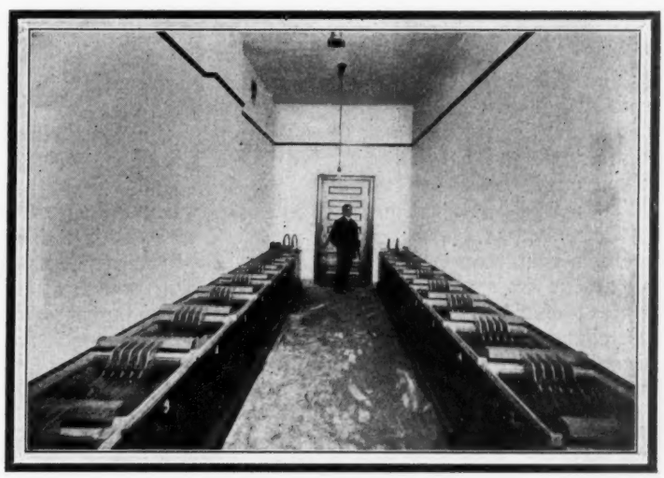


FIG. 15. BATTERY ROOM.

the cables are led to the floor above, where they enter the main switchboard shown in Fig. 12. This picture was taken before the board was in full operation, and in fact before the finishing touches had been put on the room and the debris cleared away. The board, however, forms an imposing sight when viewed from either the front or behind. The woodwork is mahogany, and in order to gain room for the accommodation of multiple jacks a trough key shelf is used which provides space below the level of the front of the key shelf for the accommodation of the jacks. This

greatly increases the capacity of the section without increasing the reach required by the operater when the ultimate capacity is installed. The well-known two-wire system of the Kellogg company is used in this installation, the jacks being placed on three-tenth-inch centers. With this size of jack and the arrangement of the sections spoken of 18,000 lines are easily accommodated in each section. Each section has ten panels, and three operators' positions, and the stiles between the sections are no wider than those between the panels of the section, thus making the face of the board practically continuous with no dividing lines whatever other than those between the panels themselves.

A general view of the power apparatus, together with the ends of the distributing frames and relay racks, is shown in Fig. 13, which also gives a view of the cable runways leading from the intermediate board to part of the main switchboard. The power switchboard is of marble, is fully equipped with Weston instruments, I. T. E. circuit breakers, and Crouse-Hinds switches. All metal work on the face of the board is copper plated and burnished, thus giving it a very handsome appearance.

The power units are of Holtzer-Cabot make, installed by the Kellogg company, and are in duplicate. Two sources of 220-volt currents are available at the exchange from outside mains, which, together with the double power plant, makes a breakdown practically out of the question. Fig. 14 shows a closer view of the power switchboard and power machines. Both the large machines shown at the left, and the ringing machines shown in the center of this picture, are mounted on piers faced with white enamel brick, these piers having heavy slate tops. The wiring between the machines and the power board, and also between the power board and the battery, is carried in iron ducts beneath the cement floor of the power room.

The battery room is shown in Fig. 15, there being two batteries of ten cells each of chloride accumulator. This room is well ventilated by ducts extending to the roof, and a sink is provided in a room adjoining for convenience in the care of the batteries.

CONCERNING THE TELEPHONE ENGINEER.*

The telephone engineer's occupation is so varied in its contact with commercial and social conditions that its scope is apparently not well understood even by those practicing similar professions. Indeed, the very existence of the telephone engineer is in some quarters denied.

To many persons the telephone instrument on the wall is the telephone system, and an art based on so little a thing seems a simple one. Yet there are involved the problems of apparatus design for electrically transmitting speech at the highest efficiency for the least and greatest distances without change of local equipment, and of receiving speech and signals from distant stations. These are three distinct and finite things, for each of which a "best way" must be determined.

Granting that the sub-station telephone set stands for too narrow a view of the whole matter, and that at least a connecting line is concerned, it is suggested that there is involved a problem of an alterating current transmission line. Due to conditions of topography and degree of congestion of population, the line may be buried or erected among a wide variety of surroundings, but must keep within the scope of this best way. As its insulation, capacity and conductivity have vital bearing on its efficiency of performance, and as they also govern its cost by the character of their design, a responsibility rests with the engineer who is to control the degree of investment by his decisions on these points.

*A paper read by S. G. McMeen before the Chicago branch of the American Institute of Electrical Engineers, May 19, 1903.

For example, "If by decreasing the electrostatic capacity between wire and wire of an undeground telephone cable by *b* microfarads the efficiency of transmission is increased by *d* per cent, at a cost per mile per year of *c* dollars, is the expense warranted?" Instances might be multiplied to prove the importance of knowledge and judgment in connection with this costly and important portion of a telephone system.

To the telephone sets and system of lines must be added the central office equipment. Of the switchboard and its appurtenances three features are important; its most striking attribute being that of multitude of things; second, that the parts must be organized to inter-operate with complete harmony; and, third, that the whole aggregation is often of such respectable size as to compare favorably with the work of an engineer of any other craft.

Location of central offices, their sizes, now and hereafter, the number, size and character of underground ducts and cables, must be considered for one conclusion, the giving of the best telephone service at the least cost, now and hereafter. And it is not to be overlooked that the factors upon which the solution depends are themselves subject to change, so that the probabilities of the occurrence, amount and direction of such change must be foreseen and discounted if possible.

It may be responded that all other engineers must take account of rates of interest, prices of material and labor, density of population, etc., and possible shifting of values. Granted; but a telephone system must be planned and begun, it is believed, a longer time before its development to its ultimate size than is true of most other works of magnitude. Because the speaking current of the telephone is a very small one, usually alternating, and so not susceptible of easy and exact measurement by simple means, there has grown up the idea that the telephone engineer does not deal with exact quantities, and does not use in his work that accuracy of observation and precision of execution which make the engineering profession a worthy one. It does not appear that this impression is correct, and there are two principal reasons why not: First, the speech transmission current is far better understood to-day than formerly, and is determined with a very great degree of accuracy and certainty, as well as are the many other currents having to do with the operations attending speech transmission.

Second, the telephone engineer requires the same qualities of observing and reasoning powers which distinguish engineers in general. As a single instance of the possibility of mathematical and physical accuracy, witness the work of Professor Pupin in the matter of distortionless circuits.

Upon the basis of these thoughts, may we not define as follows:

A telephone engineer is one who practices the design and construction of telephone apparatus, telephone circuits and telephone operating methods, and the correlation of all three into systems of telephonic communication.

If the definition be granted, let us then claim a place for him among the engineers of more classical reputation, giving him credit for his accomplishment and our best wishes for his future.

UNIQUE SWITCHBOARD AND EQUIPMENT.

Probably the most extraordinary telephone exchange apparatus now in use is that at North English, Iowa. It serves over 300 subscribers, and is operated by Mrs. Emma Magoon Post, who is totally blind.

The switchboard is a compact cabinet containing sixty-four spring jacks of novel construction and seven pairs of cords and listening keys. The front board is twelve inches square, and is divided by a strip of moulding into two sec-

tions. Each section has four rows of spring-jack holes, eight holes in each row. A shallow, round-bottomed groove connects the eight holes in each row, affording the operator a ready means of counting and connecting the holes by sliding the plug lightly along the groove from right to left or left to right. The rows may be found in the same manner by sliding the peg up or down in a vertical groove provided for that purpose.

The really striking feature of this unique exchange, however, is its system of bell signals. Each line is provided with a bell of special tone. These are mounted in a cabinet a few feet from the switchboard. There are large bells, small bells, wire clock-gongs, sleigh bells and high-keyed bicycle bells. The differing tones of the ordinary telephone bells were obtained by selection, by turning in the center, by slitting with a fine saw, or by screwing large concave washers under the nut holding the bell on the support. A fine bit of steel wire four inches long is soldered to each bell hammer, carrying a square of paper at its outer end. This paper bears the line name or number, forming a visual signal for the assistant operator, who can see. The bell cabinet is so situated that the paper squares may be plainly seen from the operator's seat. Mrs. Post is able to distinguish not only each of the forty-five bells by its peculiar tone, but also the voices of the hundreds of men, women and children whom she serves.

The North English telephone system is composed of fifteen party lines of from three to ten miles in length and having from six to twenty subscribers on each line. These lines reach all the neighboring towns and almost every farmer in the vicinity, there being two hundred and twenty-three subscribers on these fifteen lines. There are also thirty short lines having from one to five subscribers on each line. A large portion of Mrs. Post's work comes from mutual exchanges in the neighboring villages. A space of four counties is filled with a network of farmers' mutual lines. No toll is charged and many talk more than they should simply because it is free. As there are so many people on most of the lines, many calls fail because of the line being busy. Many do not answer promptly, waiting to be rung three or four times to be sure it is their call before answering. Here Mrs. Post's excellent memory places her at an advantage over the average operator. She does not allow a call to fail because of a busy line, but remembers the party calling and party wanted, and puts the call through later when the line is not busy. Her memory for voices is so good that she seldom has to ask the name of the party calling. This saves much time and annoyance. Mrs. Post receives many words of praise for her careful, painstaking work. She is skillful and rapid in her manipulations of the board, and is said rarely to make a mistake. She works all day, being relieved by an assistant at six o'clock in the evening.

Mrs. Emma Magoon Post is a graduate of the Iowa College for the Blind. She was noted while in that institution for her quick and highly retentive memory.

Wireless telephony between boats or ships was practiced long before the Hertz wave was heard of. Prof. John Trowbridge of Harvard was one of the first to propose it, and Graham Bell demonstrated its feasibility over distances of half a mile on the Potomac at least twenty years ago. Since that time scores of inventors have attempted the same thing. The chief difference between the older and later experiments is that the first ones involved simpler apparatus, and apparently gave better results than more recent endeavors, like those of Mr. Collins on the Erie ferryboats recently. When he and his friends once grasp the fundamental truth that water is an excellent conductor of electric currents, and ignore the ether completely, they may get better results.

WELL KNOWN HEADS OF WELL KNOWN HOUSES

Ernest E. Yaxley, treasurer and general manager of the Monarch Telephone Manufacturing Company, Chicago, is one of the pioneers in the Independent telephone manufacturing business. He was born in Hillsdale, Mich., forty-two years ago, where he got his early electrical and mechanical training and came to Chicago in 1882. He has devoted most of his time to the designing and building of telephone and electrical apparatus. He is a mechanical and electrical engineer of marked ability and has been identified with a number of the prominent telephone manufacturing companies. He is an inventor of note and has designed a

ERNEST E. YAXLEY.

great deal of the apparatus now in use in the Independent field. Mr. Yaxley secured his early telephone training with the Western Electric Company, Chicago. He entered the Independent telephone manufacturing field the day after the Bell receiver patent expired and has devoted his entire time to this branch of the industry ever since. He is the practical head of the Monarch company, and its success in a very large measure has been due to his inventive ability and untiring work. He is one of the most popular men in the telephone field, is conservative and a gentleman of sterling honor.

Modern luxuries are not necessarily expensive. Sutherland, Iowa, has a rural barb-wire telephone system in which the line insulators are glass bottles.

Some Oddities in the Telephonic Art

By EDWARD E. CLEMENT

To some minds a spade must ever be a spade, howsoever poetic its uses or howsoever important the results of its employment. To such minds the fact that an implement had turned the mold which covers the mortal remains of a Washington or a Grant would mean nothing more than a decrease of twenty-five cents in its value, because it was second-hand. There is, however, to most of us, a positive pleasure in regarding an instrument in the light of its uses, and to such, although the innate character of the telephone may remain as plain and simple as before, it receives an increase of dignity and perchance of romance from the nature of its present uses.

Of course, every one is familiar with the little crank which you grind, and the receiver which, placed to the ear, enables you to hear the tones of the telephone girl, pert or

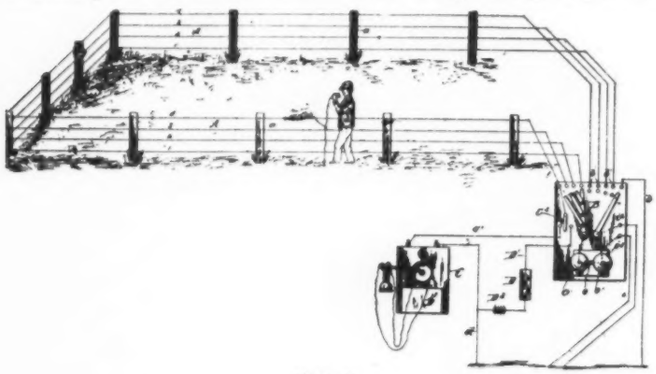


FIG. 1.

pleasant, as the case may be, and the grumpy response of the man at the other end, if he happens to be interrupted in a love letter or the computation of his last year's profits. But few are aware, probably, that this prosaic combination

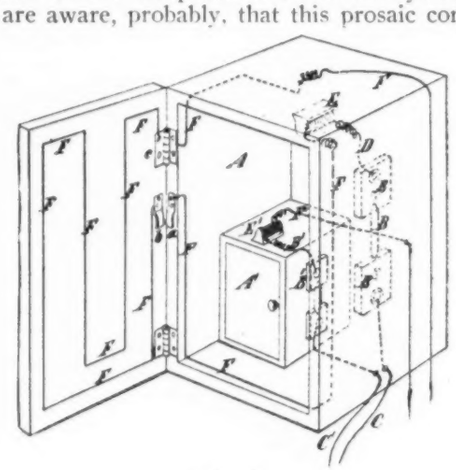


FIG. 2.

of wood and wire in many instances protects both life and property, expedites travel, finds what is hidden, restores hearing to the deaf, reveals lurking dangers in machinery that would cost human life, perhaps, if not discovered in time, and in a hundred other ways works greater miracles than ever Ariel with his lightning wings. Many farmers of the West, where wire fencing is of necessity used over immense areas, have caught the idea of utilizing the fence-wires in more than one way. As far back as August, 1891, a patent was granted to a man in Illinois for a triple utilization of fences of this kind. Before this invention so-called "electric-fences" had been made and patented, in which the fence-wire carried a current which, when an animal touched the fence, would convey a shock. This arrangement contemplated, however, the addition of alarm bells and means for switching in both telephone and telegraph instruments, as will be clearly seen from Fig. 1.

From animals endeavoring to break out to animals endeavoring to break in is but a step. In the one case the animal receives an admonitory shock, and in the other the

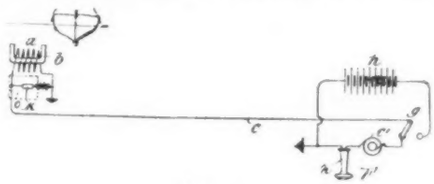


FIG. 3.

principal idea is to cause him to sound an admonitory signal at the other end of the line without receiving any intimation himself. This is very neatly accomplished by a device patented in 1881.

Fig. 2 shows a structure to be protected, as, for instance, a safe. Within the wall is fitted a microphone B, communicating, through the intervention of the usual induction

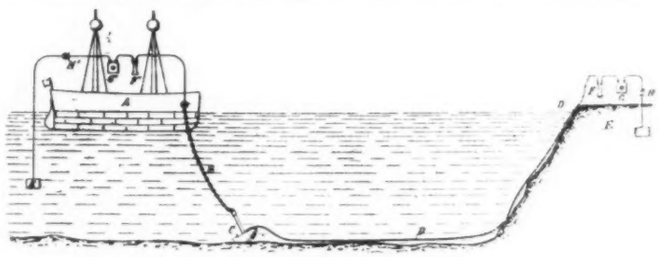


FIG. 4.

coil, with a receiver *L* at the central office. In addition to the microphone the inventor provided a balanced circuit, which would ring a bell in the local circuit of a galvanometer when the balance was disturbed. The principal idea, however, was that any noises caused by tampering with the safe would be as audible to the central office watchman as if he were in the room.

It has been frequently suggested that in case of war this

FIG. 5.

country could be amply protected—even though our defense might at first prove inadequate—by numbers of simple but powerful offensive as well as defensive means sure to be produced under the stimulation of actual danger by our active Yankee inventors. I believe Mr. Frank Stockton first suggested the idea in one of his fanciful stories of an electro-magnetic sentinel, which would advertise the coming of war vessels while they were still in the dim and remote distance. This very idea forms the basis of the

invention of a well known Chicago engineer. He provides a station on shore, as shown in Fig. 3, containing a generator of periodic current e', a telephone m, a source of high

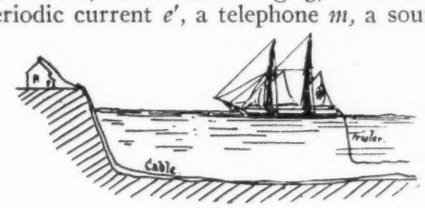


FIG. 6.

potential h, and a switch g. From the central station a cable c is run out into the harbor, or other body of water to

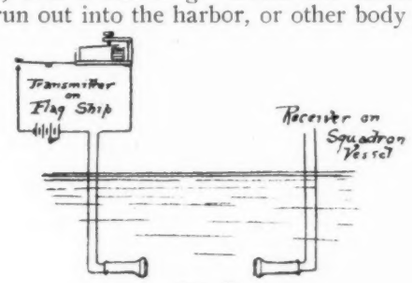


FIG. 7.

be protected, and at the outer end of the cable a water-tight case is attached containing an incomplete magnetic circuit

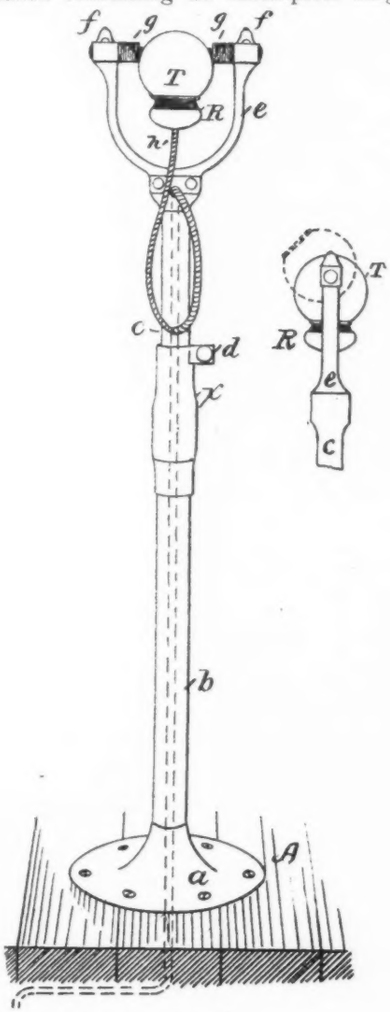


FIG. 8.

b, with a winding a, which is shunted by a resistance. In the shunt circuit is a fuse k, which serves to ignite a body of explosive, also contained in the case. The switch g being to the left, as shown, the normal flow of periodic current is through the telephone, or through the cable, through the winding a, and to ground or return. When a large body of magnetic material, such as a steel war ship, approaches the sunken case, the self-induction of the coil a is increased and the sound is distinctly audible in the telephone. The operator at the telephone, at the moment that the sounds become loudest, has only to throw the switch g to the right to cause a heavy current to pass out over the cable and ignite the explosive. An automatic arrangement with balanced forces, to produce the same result, has also been devised. The double purpose is thus subserved of giving warning of the approach of the enemy and disposing of him with neatness and dispatch.

Of a more pacific character, but still pertaining to sea communication, are Professor Blake's submarine signaling patents, both issued in 1894. Professor Blake conducted some investigations on the lightships of the Atlantic sea-

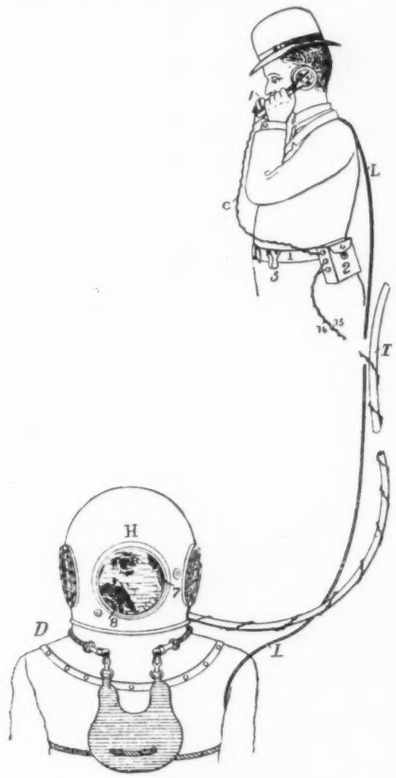


FIG. 9.

board with a view to perfecting a method both ready and reliable of communication between their crews and the shore. Not the least interesting feature of this achievement is the simplicity of the apparatus employed. In Fig. 4, E is the shore station; D is an insulated cable lying on the bottom and connected at its outer end to the lightship anchor C. From there the circuit is completed through the chain-cable B, which is described as of non-corroding metal, to and through a low resistance telephone C′ F′ on the lightship A, and thence to water-plate K. The shore instruments are marked F G and the batteries H H′. With this arrangement it has been found perfectly practicable to maintain constant communication, even in heavy weather, with the crew of the lightship, a boon which can best be appreciated by those who have spent any considerable time in the confinement of such vessels.

A second arrangement of Professor Blake's apparatus is shown in Fig. 5, by which the same results are accomplished without any direct connection at all, through electrification of the region M′ in the water, the potential between two widely separated points being varied by the voice in speak-

ing. Corresponding differences of potential set up in the conductor leading to the shore station enable successful transmission of messages. In this connection it is interesting to note that somewhat similar means have been employed and patented abroad. In English patent No. 3132 of 1879, as shown in Fig. 6, a submerged cable B receives inductively a telephone message from the conductor A, which trails over the stern of a ship.

Means for communicating directly, through the water itself, between ships of a fleet is also shown in English patent No. 584 of 1878. Fig. 7 shows the apparatus used, which is very simple.

Any telephone apparatus that is to be used on board ship, whether in the above systems or for local communication,

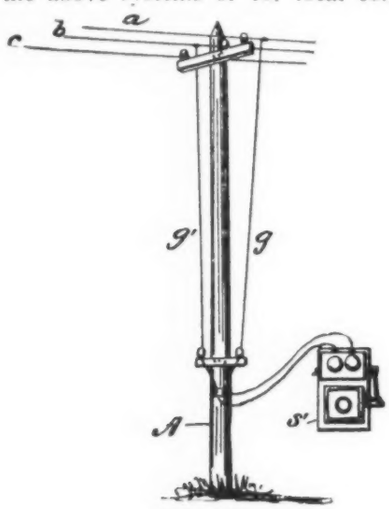


FIG. 10.

must of necessity be of special design, combining simplicity and compactness with absolute security against the entrance of salt water or atmospheric moisture. A special design of this kind was patented by Mr. Hammond V. Hayes, in 1891, and has been extensively used in the navy. Fig. 8 shows in a general way the appearance of the apparatus which is used on deck. *b* is a stanchion carrying a fork or bifurcation *c*, the foot of which is adjustable vertically in the stanchion. Journalled in the fork is a transmitter T, which is contained in a spherical water-proof casing, eccentrically mounted and heavily weighted at *j* so that when unimpeded it will turn up as shown in the small detail figure to the right. It is normally held down, however, by the weight of the receiver R, which is of watch-case type and is adapted to be inserted into the mouthpiece of the trans-

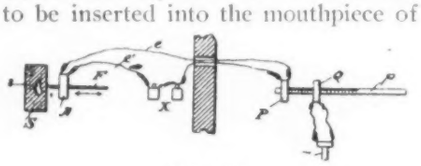


FIG. 11.

mitter, thus closing both, and at the same time constituting an over-balance weight. The necessary switch connections are made and broken by the turning of the pintles inside the insulation g g. The entire design is well adapted to meet the requirements of heavy service and at the same time has a certain amount of grace.

Another invention of Mr. Hayes is a diver's telephone apparatus, shown in Fig. 9. Here the receivers and transmitters at both ends of the line are directly in the main circuit in series, no induction coil being used. The operator on deck uses a combination instrument A consisting of a bar shaped like the letter U, carrying both transmitter and receiver. The diver's instruments are shown at 7 and 8, one secured to the side and the other to the front of his helmet inside. The battery 2 is carried in a small case supported by a belt around the deck operator's waist. This belt also serves, by means of a hook 6, to support the instruments when not in use. The conductors are shown as twisted about the air-pipe, but they might well be carried down in a separate cable.

Many of our railway telegraphers can recall instances of wrecks where a train disabled on a lonely section of road, shut in perhaps by snowdrifts, lay at the mercy of the elements while some luckless flagman tramped back over miles

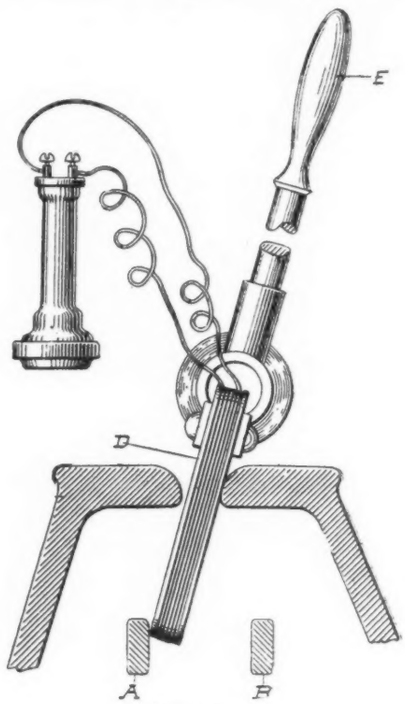


FIG. 12.

and miles of wind-swept and snow-drifted track to apprise the nearest station master and call for assistance. There have also been instances, not always well authenticated, we confess, of an intrepid operator who happened to be on the train, climbing a pole in the teeth of the wintry blast, and either improvising a key with his pocket knife and a penny, or telegraphing back by touching the wire ends together, and receiving the response on his tongue. Such expedients have prompted more than one inventor to provide means

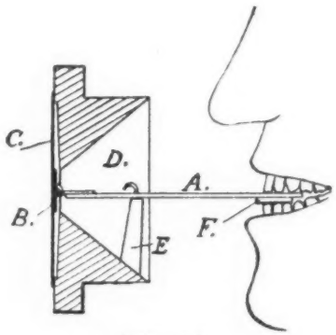


FIG. 13.

whereby the uninitiated could communicate along the road in cases of emergency.

An example of these devices is found in a patent granted in 1895—see Fig. 10. Here the terminal stations are connected by three wires *a*, *b* and *c*, and tap wires *g g'* are carried down upon telegraph poles within the limits of each section, terminating in sockets at the base of the pole. A portable telephone set is supposed to be carried by the conductor or other trainman, which can be plugged into any of

these sockets, thus putting them into direct communication with the terminal station, without at the same time interrupting through business. It goes without saying that in our crowded city streets, where electric cars and cable cars frequently break down or are disabled by burn-outs, such a device is of considerable value.

The telephone constitutes, perhaps,, the most delicate, if not the most nearly infallible, means for many tests. Its uses in railway work particularly are many and varied. An ingenious application to the testing of metals after casting or rolling, which is not confined to railway work, is found in the DePlace patent of 1891, shown in Fig. 11. Here a

FIG. 14.

microphone A, within which works a striker, F, is shown in circuit with a battery X and a coil P. A scale *p* upon which the coil P is mounted, and a sliding coil Q are provided, together with a receiver T. As the striker F is reciprocated against the body of the metal S the coil Q can be so adjusted that no sound is heard in the receiver T. If the striker comes over the flaw *s*, however, a certain amount of resonance is developed, which is immediately detected in the receiver.

As an example of other testing work for which the telephone is well adapted, we have the Bentley fault-detector for electric railways. In this device Fig 12, a coil D, in circuit with a receiver, is mounted upon a suitable handle E.

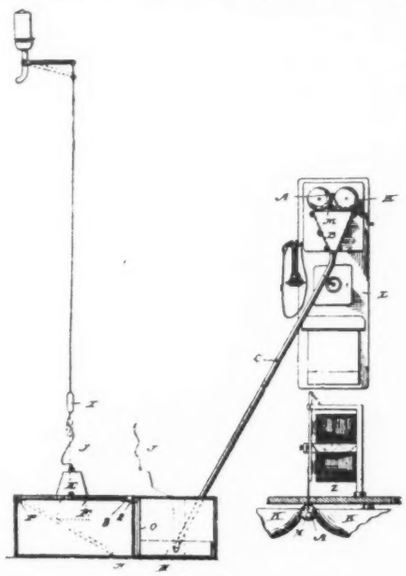


FIG. 15.

In case of a ground on the line conductor of a conduit road, the coil D being inserted through the slot of the conduit will readily detect the fault, for the reason that the false circuits will include only such portions of the line conductor as are between the generator and the grounded point, so that there will be a variation in the current upon the conductor sections preceding and succeeding the fault, which will inductively affect the coil D and thereby the receiver, causing sounds therein.

Two adaptations of the telephone, which perform the seemingly impossible feats of hearing without ears and seeing without eyes, are found in a Fisk patent of 1880 and a Williamson-Hickies patent of 1888, shown in Fig. 13. In the Fisk patent a link is provided which may be attached to the diaphragm at B, the other end being held between the teeth, the sound thus being communicated through the bones of the head. The link is made detachable so that each deaf man may carry his own link.

The Williamson-Hickies patent is for an ore detector, and, as shown in Fig. 14, contemplates the use of a pair of brushes DD′, a battery A and a receiver B, all connected

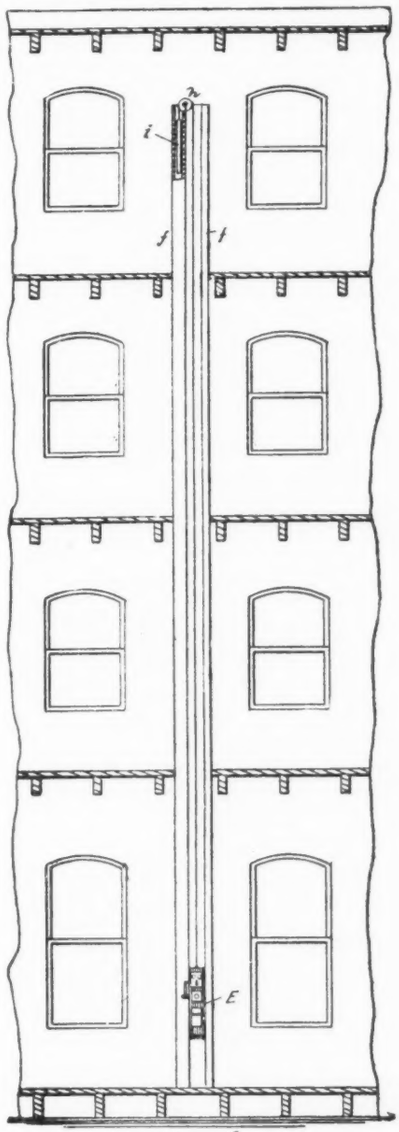


FIG. 16.

in a circuit *a*. When the brushes are drawn over the face of the rock metals contained therein are supposed to conduct the current, and the scraping movements of the brushes produce variations which cause sounds in the telephone.

There is probably no greater annoyance caused by anything to the telephone girls at central than that occasioned by the failure of subscribers to answer their bells when called. That this fact has been recognized and at least one cause for it assigned, we may infer from a patent granted to a Kansas man in 1887—see Fig. 15. This inventor poises a loose bullet on the bell clapper of a factory telephone at A, and arranges a funnel B underneath the same so that the bullet will fall into the funnel when the bell

rings, will fall through a tube C, and dash against a trigger H, thereby turning the shaft O, disengaging the pins 2 and 3, and releasing the weight E, which thereupon pulls the cord and blows the factory whistle. That his call would be answered is almost a certainty, but that it would be always agreeable, particularly if the owner of the telephone sat in his office and received frequent calls, is somewhat doubtful. It is also somewhat doubtful how long surrounding residents or business men would tolerate it.

To offset the annoyance caused the telephone people by their subscribers there are some trifling annoyances with which the subscriber has to put up. Not the least among these is the audacious and entirely unwarranted habit on the part of the telephone companies of charging rental for each telephone used. An ingenious Pennsylvania gentleman has gotten around this difficulty by providing a telephone elevator, shown in Fig. 16, by means of which the same telephone may be used on any floor of a building, thus saving rental. The telephone E is raised and lowered by a rope passing up over the sheave *h* and carrying a counter weight *i*. As a legitimate extension of this idea a cash carrier system might be inaugurated by which the telephone could be instantly jerked to any part of the building, or, for that matter, to any part of the city desired, thus at once, and in the simplest way, defeating the greedy spirit of the grasping telephone magnates.

A very interesting and amusing combination of science and law was brought about in Chicago three years ago as a result of which a certain attorney was placed under $1,500 bonds for sending an alleged improper letter to the wife of a well known doctor. The drama had but a single act, but at its conclusion the villain was brought to confusion and virtue triumphed, all through the telephone. The situations in the drama were prepared by Attorney Luther Laflin Mills. Assistance in carrying them into execution was given by Electrician J. P. Ellicott, Inspector Stuart and Detective Sandmier, together with the defendant. A new silk hat was obtained. To the inside of the crown Mr. Ellicott affixed a sensitive microphone-transmitter. Very fine wires were attached to the transmitter, which, when the doctor had the hat on, passed down behind his ear, beneath his vest, and through the leg of his trousers to the heel of his shoe. The battery was a small rubber-cased pocket-battery. At the other end of the wire, which was some sixty feet long, the detectives waited with ordinary receivers at their ears. It seems that the attorney had sent for the doctor to come to his office. The doctor went, accompanied by his silent witness. The instrument worked like a charm, and along the tiny wire the attorney's language ran, convicting him out of his own mouth, and landing him in a cell.

There are many other uses to which the instrument of Bell and Edison has been or can be put. Its capabilities are endless, its adaptability perfect. Wherever the sound of a human voice can direct human action, or nurture hope, or convict villainy, or avert calamity, or import joy, there the telephone can and will be used, a potent factor among the forces of modern civilization.

Decisions Affecting Telephony.

By G. W. Hand.

WANT OF DUE CARE IN TAKING DOWN TELEPHONE POLES.

The care that should be exercised by telephone companies in taking down poles is illustrated by the case of Kyes vs. Valley Telephone Company, which was decided recently by the Supreme Court of Michigan. Roderick Kyes was a general foreman in the work of paving Saginaw street, in the city of Flint. The Valley Telephone Company, which operates in the city of Flint, had been notified to remove its telephone poles from the street, which it was doing at the time of the accident. The wires had been removed from the pole in question. When the guy rope was cut the pole fell and struck Keys, who at the time was engaged in filling a sewer trench some thirty-five feet away. Kyes remained unconscious the most of the time until the following day, when he died.

Suit was brought by his wife in the Circuit Court and a judgment of five thousand dollars obtained. Appeal was taken to the Supreme Court and the judgment was sustained. The claim on which the judgment was sought was that the telephone company had not taken sufficient precautions to notify Kyes of his danger and having gone ahead without this notice had assumed the dangers attendant to the work. The testimony showed that Kyes had not been notified that there was any danger. The fact that he knew that the wires were being cut was not, in the opinion of the court, sufficient notice that the pole would fall. "He had a right," said the court, "to act upon the belief that when the defendant employes were ready to take down the pole they would notify him if there was any danger, or would adopt safe means to take it down." This fact of want of positive notice on the part of the telephone company to Kyes made it liable for the resulting injury, which probably would have been obviated had he been warned of his danger. The defendant company endeavored to show that Kyes had been guilty of contributory negligence sufficient to bar his right of recovery, but the court maintained its position that it was the duty of the telephone company to warn him before proceeding to take down the pole.—*Kyes vs. Valley Telephone Company*, 93 *N. W.*, 623.

IN LOUISIANA COMPANIES HAVE THE RIGHT TO PLACE POLES ON RAILROAD RIGHT OF WAY.

In a case appealed from one of the Judicial District Courts of Louisiana to the Supreme Court of that state, the Kansas City, S. & G. Ry. Co., defendant in the suit, endeavored to set aside a judgment rendered in favor of the Southwestern Telephone Co. granting the use of a part of the right of way of the railroad for the poles of the telephone company. The distance covered by the grant was from the Sabine river to the city of Shreveport and thence to the Arkansas line, and from DeQuincy to Lake Charles, a total of two hundred and eighty-four miles. The extent of the grant was a strip three feet wide on the east side of the railroad right of way. The telephone company relied on one of the statutes of the state authorizing the construction and maintenance of telephone lines "along and parallel to any railroad in the state." In the lower court the right of way was given the telephone company for which it was to pay the railroad corporation at the rate of ten dollars per mile.

The railroad appealed from this decision on the ground that the law granting telephone companies the right to place their lines "along and parallel to any railroad" does not give the telephone companies the right to place their lines on the railroad. The law as interpreted by the railroad company meant that the telephone lines were to run parallel to but not on the railroad right of way. The court answered that the telephone company did not propose to place its poles on the

railroad, but along the right of way, thus interpreting the statute to mean that "along and parallel" meant on the right of way.

The question of value of the land taken by the telephone company was also discussed by the court. The evidence furnished conflicting values, some as low as $2.50 per mile, and others as high as $3,000. The court in passing on the point obtained by mathematical calculation the value of a strip of land three feet wide and of the length in question in the territory from which it had been "expropriated" to be $23.45 per mile. The fact was also considered that the telephone company got no title to the land, but merely a right of use. Also, that inasmuch as the telephone lines were so near the timber that it would devolve upon the telephone company to keep the limbs cut back and the undergrowth cleared. Considering the actual value of the land and the rights that the telephone company obtained the Supreme Court held ten dollars per acre to be a fair remuneration.—*Southwestern Telephone Co. vs. Kansas City, S. & G. Ry. Co.*, 33 *South. Rep.*, 910.

RIGHT OF EMINENT DOMAIN TO LAY GAS PIPES DOES NOT INCLUDE AS AN INCIDENT RIGHT THE RIGHT TO ERECT A TELEPONE LINE.

The question of the right of a natural gas company to maintain a telephone line along the right of way of its gas pipes as an incident to its corporate right to lay the pipes, recently came up in the Supreme Court of Pennsylvania in the case of Woods vs. Greensboro Natural Gas Co. Joseph B. Woods, the plaintiff in the case, was the owner of a tract of two hundred acres of land in the county of Allegheny over which the gas company had been given the charter right to lay its pipes for the purpose of carrying its product to the towns beyond. The pipe lines had been in operation for some time when the gas company found it expedient to erect a telephone line along the right of way of its pipes, and accordingly filed a bond in the Court of Common Pleas to secure Woods the damages which would be incurred in erecting and maintaining the telephone line. Woods did not desire to have the telephone lines and poles on his land and filed a bill to restrain the gas company from erecting the proposed telephone line.

Woods secured this injunction in the lower court. The gas company in its appeal contended that erecting a telephone line was incidental to the right which the state law gave it to lay its pipe. The gas company claimed that a telephone line was necessary in operating the pipe line, and that it should be allowed to proceed. The Supreme Court in reviewing the proceedings said that the question was one merely of corporate power, which was to be determined by an inspection of the charter of the gas company. The act under which the gas company obtained its charter gave "the right of eminent domain for the laying of pipe lines for the distribution and transportation of natural gas." The erecting of a telephone line in the opinion of the court was an exercise of the right of eminent domain entirely apart from and independent of the corporate right of laying pipes as given by the charter. The court found that while a telephone line would be highly desirable, yet the gas company could operate without it and had done so for six years, and therefore it was not "impracticable" to so operate without the telephone. Inasmuch as the gas company would be exceeding its corporate rights in erecting the telephone line which had been planned, the Supreme Court affirmed the decree of the court below and dismissed the appeal.—*Woods vs. Greensboro Natural Gas Co.*, 54 *Atlan. Rep.*, 470.

Herr Jentsch, German inspector of ports, in the course of an address on the development of the telephone and telegraph, recently stated that a telephone between Berlin and New York was technically possible. It is merely a question of cost, he said.

PROMINENT EXCHANGE MANAGERS

Edward E. Webster, general manager of the Twin City Telephone Company of Minneapolis and St. Paul, is one of the most prominent exchange managers in the Independent telephone field. He is a man of wide experience and possesses an enviable reputation for business push and integrity. His careful study of telephone conditions throughout the country has enabled him to place his company in the foremost rank of successful enterprises. His belief has been

EDWARD E. WEBSTER.

that if a telephone operating company would succeed it must give first-class service at reasonable rates and that the wants, rights and feelings of the telephone user should be given first consideration. It is on these lines that Mr. Webster has managed the Twin City Telephone Company, and its phenominal success is a sufficient evidence of the correctness of his theory. He is a man of strong personality and enjoys the confidence and esteem, not only of his associates in business, but of the whole telephone-using public of the twin cities.

MUNICIPAL TELEPHONY IN ENGLAND.

It has just been definitely decided that the municipal telephone system of Tunbridge Wells, England, is to be acquired by the National Telephone Company, the director-general having approved certain conditions, such as the date of expiration of the license. Other cities are still occupying themselves with the installation of their own telephone systems, apparently not discouraged by the example of Tunbridge Wells.—*L'Electricien*, Paris.

Just About Wire

By R. B. ABBOTT

It might take us—and you—more than a minute or two to justify this title, but if you will give the matter as much consideration as we have, we will feel fully repaid, and have no doubt but that you will be benefited and brought to a fuller realization of the part that wire bears to your investment in telephony. You may consider other things—instruments, board, style of service, etc., etc.—of more importance, and perhaps be correct, but right now we are treating of wire and wire only. We have known so many new Independent companies that have considered the wire proposition of so little importance as to leave the selection of same to the local hardware dealer, and it is to such that this article should appeal. Fence wire is all right in its place, but its place is on a fence, and such wire will not do for telephone service—providing yours is to be a permanent investment.

A certain construction company at one time was convinced that fence wire (and barbed at that) was the correct thing for its subscribers, or rather that portion who could not properly speak ordinary United States. It argued that the "barbs" gave the necessary "jerk," rendering the conversation intelligible, and it was by the use of such wire only that it could "hold 'em in line," as it were. On the same basis another promoter constructed with plain fence wire, putting "27 on a line," using fence posts in place of poles, whereby he estimated his cost at $10 per mile. The latter would have used barb wire instead of plain fence just the same as did the former, but Ringling Brothers camped in his town, and the menagerie were wont to use the "barbs" as back scratches, thereby causing "crosses" and "grounds." These two have now, we are pleased to say, been reformed and now use the best grade of wire. Such is the result of experience. It is to the new construction companies that we direct our remarks—the older and more successful exchanges having learned that "the best is none too good." It really seems strange, but the majority of companies now organizing and constructing refuse to profit on the wire question by the experience of others, and fence wire is used to an enormous extent, particularly on "farmers' lines," and such short sightedness is amazing when all is considered. Your poles, cross arms, insulators, labor, etc., etc., cost the same, and why should you try to save $1 to $1.50 per metallic mile by using cheap and insufficiently galvanized wire, which lacks not only durability but likewise conductivity, and will have to be replaced in the course of a few years.

For city lines, No. 14 is used almost invariably; for farmers' lines, No. 12, and for toll lines, No. 10, and in a few cases No. 8. This wire should all be of the "B.B." grade, with possible exceptions in the first and last instances. In the former the "steel" grade is quite acceptable in towns where cable is used, because the additional ohm resistance is offset by the copper in the cable, and besides you secure a greater strength. In the latter case (pertaining to toll lines) should the length of the line be over 50 to 75 miles the "E. B. B." grade should be used up to say 150 miles. If the distance is greater, nothing but copper will give satisfactory results, and the wire must be not smaller than No. 10, otherwise "maintenance will eat you up." Of course, on "E. B. B." wire, or for that matter, a "B. B." will talk farther than the 150 miles mentioned, but it is not economy to use iron for such distances because of the superior conductivity of copper.

On this basis, and to prove the argument of economy in the use of copper for long distance lines, let us do some figuring. We will say that you have constructed 250 miles of toll at a cost (less the wire) of $100 per mile, or $25,000. A metallic circuit of 10 B B would bring it to (minus the labor) $30,362.50 (500 miles, 260 pounds to the mile at 4⅛c per pound). Under the same conditions a metallic circuit of copper would bring it to $38,383.75 (500 miles, 166 pounds to the mile, at 16⅛c per pound), which represents a cost of about 25 per cent over the iron circuit, and your efficiency is increased about 100 per cent, for on such a circuit you can get through in three minutes a conversation that would require at least five minutes on an iron circuit. If your rate is based on a five-minute schedule (as most are) your customer gets better and quicker service and you are money ahead. There are just three grades of galvanized telephone wire—"E. B. B.," "B. B." and "steel." Their respective mile ohm value being 4700, 5500 and 6500, with an average breaking strain (multiplied by the weight per mile) of 3, 3.3 and 3.7 respectively—the mile ohm equaling the weight per mile multiplied by the resistance per mile. The Belgian system of rolling long lengths of wire rods is used in the manufacture of this wire, and permits of its being drawn to extreme lengths of 1-4, 1-3 and 1-2 mile (depending on the guage) without a single splice or joint, which accounts, in part, for its strength. As there are three grades, so are there three properties—mechanical strength (just accounted for), conductivity and durability. The conductivity being guaged by the number of pounds per mile ohm—the difference in conductivity being due to the specific conductivity of the pure metal used, viz.: iron and zinc, and also the percentage of carbon.

Conductivity is sacrificed to strength, and vice versa, so that the "E. B. B.," while a better conductor, has the least tensile strength, whereas the "steel" being the poorest conductor, has the greatest strength, rendering the "B. B." the happy medium as is evidenced by the fact that fully 85 per cent of the total product is represented by this grade.

Now we come to durability, and it is all in the galvanizing, with each grade having the same amount of spelter—the finish being known as "double" galvanizing. It is this very process which puzzles the average wire manufacturer and has confined the production of telephone wire to so few factories, which perhaps explains its price as compared with other steel and iron wires, although the grade of rod used is much superior to the ordinary commercial goods.

Diameter in Miles.			Weight per Mile.			Strength and Ductility.		Resistance per mile @ 60° F. International ohms.
Required	Maximum	Minimum	Required	Maximum	Minimum	Minimum Breaking wt. lbs.	Twists in 6 inches	
135	140	130	260	270	255	Req. 750 Min. 715	28 26	22.04

After being wiped thoroughly dry the wire is passed through a huge vat of spelter at several hundred degrees Fahrenheit, is brought out through compressed rollers of asbestos, which gives it the first coat. It is then run through at a lower temperature, though at a speed that prevents the burning of the wire, or removal of the first coat. This second deposit insures longevity, is uniform, and will not crack when bent to a circle equal to the diameter of the wire. British postoffice specifications on this wire for No. 10 "B. B." are as in table above.

The wire to be sufficiently galvanized with zinc spelter,

to be plunged into a saturated solution of sulphate of copper at 60 degrees Fahrenheit, for 1 minute, removed, wiped dry, and for this process to be performed four times without there being (as there would be, if the coating of zinc were too thin) any sign of a reddish deposit of metallic copper on the wire. In this country the wire must meet Western Union specifications, as follows: "Must be soft and pliable, and capable of 15 per cent elongation, without breaking, after being galvanized. Must not break under a less strain than 2½ times its weight per mile. For ductility, the sample to be gripped by two vices, 5.4 inches apart, and twisted, the number of twists to be not less than fifteen, in a six-inch length. The weight per mile (No. 10) to be 260 pounds, or as near as practicable. The electrical resistance in ohms per mile at 68 degrees Fahrenheit must not exceed the quotient arising from dividing the constant number 4800 by the weight of the wire in pounds per mile. The co-efficient .003 to be allowed for each degree F. in reducing to standard temperature. The wire to be galvanized sufficiently to permit of 4 insertions of one minute each, being wiped thoroughly dry between insertions. If it then appears black, it shows proper deposit of spelter, but if it has a copper color, the iron is exposed, showing that the zinc is too thin."

This last test being the most important of all, the Western Union keeps an inspector in a certain wire factory in the east to test for galvanizing a certain percentage of the wire made for its use. Of course, it is not convenient, or in fact necessary for Independents to apply all these tests, but if in doubt about the quality of the goods, the galvanizing test referred to here can be easily made by use of your blue vitriol battery jar. Technique is always tiresome, but in this article we have deemed it necessary because of the importance of the subject. You should use nothing but the best wire in your construction, and deal with responsible houses. Common fence wire, as a rule, is put up in catch weight buches of about 63 pounds each. The genuine double galvanized telephone wire is put up: No. 14, ½-mile coils, weighing 50 pounds; No. 12, ½-mile coils, weighing 85 pounds; No. 10, ½-mile coils, weighing 130 pounds, and is invariably sealed with a wire and lead seal bearing a tag stamped with the name or initials of the manufacturer, the size, and grade of the wire. This insurance, as it were, was rendered necessary by unscrupulous parties, who bought galvanized fence wire, put it up in regulation size coils, and palmed it off on the unsophisticated as the genuine article. The writer has met with many and varied experiences with new Independent companies on the wire question, one of which may be worth the telling: About two years ago, in conversation with an exchange "manager," in endeavoring to show him the error of his ways by proving the false economy of using fence wire, the manager said: "Young man, I have been in the hardware business for twenty-two years, and as you don't appear to be over twenty-five or thirty, I think I can safely say that I know more about wire than you could possibly have learned by now, and what's good enough for the farmer to fence in his property is good enough for him to talk over." On another occasion I met in South Dakota a brand new telephone man, who had actually purchased seventy-five miles of what is known as "coppered market wire," under the impression that it was as good as copper, and since he had always understood that the only strength of wire was in the crust, he reasoned out that the conductivity followed the same lines, and consequently, coppered was as good as copper, and represented a big saving in the bargain. From a standpoint of durability it would have been better to use a plain fence wire, coated with boiled oil. As yet aluminum wire for telephone purposes is very much of an experiment, having a tendency to break unexpectedly and without apparent reason, unless it be the failure to conform to atmospheric conditions. We only know of a few instances where this wire is in use in long spans (since ordinary B. B. or copper would be too heavy), and it is with this knowledge that the preceding statement is made. Some few years ago a "bi-metallic" wire was introduced, but apparently was not a commercial success, for it is not on the market to-day. This wire was made up of a steel center with a cover (rolled on) of copper. Its conductivity was about 65 per cent of that of pure copper, whereas its breaking strength was about 35 per cent greater than that of hard drawn copper. The cost of such construction brought the selling price so near that of copper as to make it commercially impractical. To sum up, your needs are confined to copper and galvanized iron or steel. The copper is, of course, the ideal conductor, though under certain conditions a needless extravagance. You would not be apt to accept a substitute for copper at ½ to 1 cent less than copper itself, so why try to do so on the other. Use the "steel" grade if you don't feel justified in going higher, but never, never trifle with fencing, for in a remarkably short time it means reconstruction, and reconstruction beyond the percentage of depreciation, means no dividends—going further, this means a new management and a decided disinclination on the part of investors to back you up for your natural growth.

A CHANGE OF FRONT.

A significant indication that monopoly interests are not absolutely secure in New England is furnished by the attitude of those interests toward certain proposed legislation in the State of Massachusetts. A formidable movement has recently developed having in view the formation of a state commission which shall exercise supervision and a measure of control over all telephone enterprises. The idea is not a new one in Massachusetts, but heretofore it has encountered the determined opposition of the Bell company. Now, however, this opposition has changed into positive friendliness, and there is an unmistakable anxiety to get beneath the protecting wing of a commission. Of course, such action entails some sacrifice, and in view of the usual Bell policy of holding out to the inglorious end before making the slightest concession, it would seem that competition is extraordinarily threatening in this particular case.

Mr. N. N. Spofford of Haverhill, Mass., in a letter to TELEPHONY in reference to the New England situation, says:

"We have had an Independent telephone company in Haverhill for over six years, and have over six hundred subscribers at the present time. We also own a franchise at Lynn and twelve other cities and towns in Essex county. We have several miles of conduits already laid in Lynn, and are hoping to get our exchange running there this year. The Automatic Telephone Company has a flourishing exchange at New Bedford, with about 750 telephones.

"The development in New England so far has been mostly in the smaller towns. There are about 12,000 Independent telephones in New England. Only three of the Independent companies have ever sold out in this territory, and I think you will find that the people in the business here are as faithful to the cause as anywhere in the country. We have certainly had as many hardships to meet as any one has. The methods taken by the old company to drive us out of business would make even the Standard Oil Company blush with shame."

It will be seen that this section of the country is not different from the remainder of the telephone field. The Independent movement has had a rather late beginning; that is all. The readiness of the monopoly to accept the refuge it has hitherto scorned is evidence that the tide is rising with the rapidity characteristic of Independent progress everywhere.

An Eastern farmer who had just had a telephone placed in his house drove six miles to town to make inquiries about the regulations for toll-line service. A fellow will forget sometimes.

QUESTIONS AND ANSWERS

Conducted by J. C. KELSEY, Professor of Telephony, Purdue University.

What is a selenium cell?—C. H. P.

Selenium was discovered in a deposit from the sulphuric acid chambers of a factory in Sweden, a great many years ago. The name is derived from a Greek word meaning the moon, on account of its similarity to the element tellurium, from the Greek, tellus, meaning the earth. It is found in a great many places, but not in abundance. It is also found with other minerals, especially in certain iron and copper pyrites, and where these are used in the manufacture of sulphuric acid a red deposit containing selenium is found in the chambers. It is obtained from the deposit by heating it in a water bath with a concentrated solution. Selenium is deposited in cherry red flakes.

Metallic selenium conducts electricity, and exposure to light increases its conducting power. The peculiar effect of light is best exhibited on selenium which has been exposed for a considerable time to a temperature of 210 degrees, until it has attained a granular crystalline condition. Non-luminous heat rays do not exert an influence of this kind, and when the selenium is heated its electrical resistance is increased.

A selenium cell is one in which a mass of selenium has been fused between two conducting wires. Platinized silver makes good electrodes. Wind two spirals around a block of hard wood, keep them separate and a constant distance apart. The space between the wires is filled with the fused selenium. When one of the faces of the selenium is exposed to light, and the other to the dark, a difference of po-

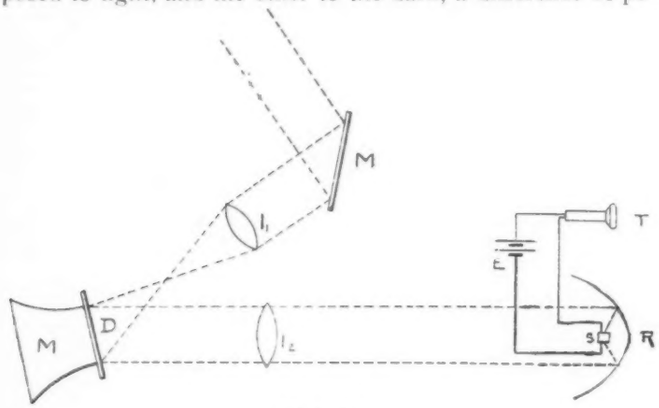


FIG. 1.

tential is produced. A maximum electromotive force of .12 volts is attained. This will disappear instantly when both electrodes are darkened. If both are illuminated, no difference of potential exists.

Some of the uses of the cell are as follows: Cells may be arranged so that the approach of daylight may fall upon the electrodes in such a manner as to produce an electromotive force, which will furnish enough current to operate a relay, or electromagnet, which controls an electric light. The approach of daylight will then extinguish the light, and darkness will make the cell entirely useless, and allows the magnet to close the circuit of the lighting circuit.

It is used in certain work in telephony. Under the head of Radiophony in the Electric Telephone, by Houston and Kennely, the operation is described at length. Looking at Fig. 1, it is seen that the rays of light impinge upon a mirror M, and are reflected through a lens, L 1, and fall upon a polished diaphragm D, clamped before a mouthpiece M. The reflected beam passes through another lens, L2, and reaches a reflector at R. This reflector focuses the light rays upon the selenium cell, S, which is in circuit with a receiver and a battery. Speaking into the mouthpiece will agitate the diaphragm, and will affect the reflected rays corresponding to the voice. The reflector acts upon the cell, which responds to the changes and reproduces the voice in the receiver. The distance is not great and the method is of no value commercially. The cell must be so made that the greatest amount of surface is exposed to the light. If the resistance changes to the amount of one-half, a great range is given—anywhere from five hundred to one thousand ohms. A cell with twelve hundred ohms' resistance in the light will show six hundred in the dark. Truly selenium is a remarkable substance.

I wish to make use of two telegraph lines for a telephone circuit, the telephone to be connected as shown in Fig. 2. The telephones are to be connected about thirty-five miles from one another. There are no telegraph instruments between the two telephones, and sup-

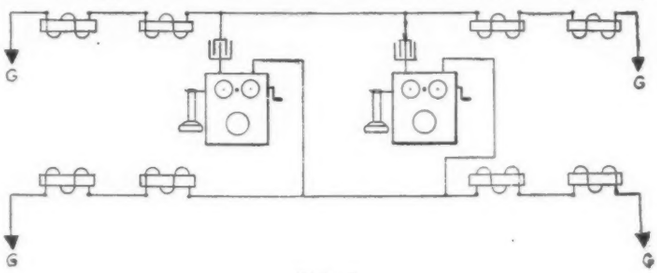


FIG. 2.

pose also that the relays beyond the telephone circuit would give sufficient impedance to the talking currents. Would this arrangement be practical and give fairly good results? Would it disturb the telegraph lines in any way?—J. F. H.

Such an arrangement would in no way disturb the telegraph lines. Although there is no guarantee that the telephones would not be disturbed. But fairly good results should be obtained. You surely will hear the inequalities between the two telegraph lines, for the condenser would transmit such changes through itself and the telephone. Last summer we tried such a method on the Duluth and Iron Range telegraph lines, and found it very noisy, but it furnished fair transmission, if a person did not mind the extremely loud ticking of the telegraph. A method according to Fig. 3 was tried with some success. Fifty ohm retardation coils were inserted directly in the telegraph lines.

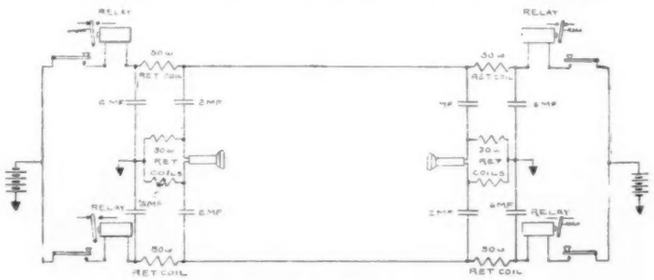


FIG. 3.

The telephone set was placed in bridge with condensers on each side of it. Two thirty ohm impedances were put in parallel with the telephone set, and the center of the impedances run to ground. Then two six microfarad condensers were placed across the line behind the fifty ohm impedances, and connected to ground. But in spite of good

transmission results, it was found nearly impossible to ring each other's bells. However, if you have powerful generators, and bells well adjusted, no difficulty ought to be encountered. It is much easier to convert your telephone lines to telegraph service than to convert the telegraph lines to telephone service. In this case, however, there are no intermediate stations, and each telephone station should be treated as the long distance company treats like cases. It would be an easy matter to connect the telephone, as shown in Fig. 2. A moment's trial would tell more than anything else. Then ring on the combined lines with a strong magneto, to see if any of the telegraph instruments were affected. Fig. 3 would have a tendency to protect the telegraph instruments from the effects of a generator.

In using central energy switchboards, and the local battery central energy telephone made by the Stromberg-Carlson Telephone Manufacturing company, can you get as good service out of common return as you could out of full metallic?—J. B. C.

This seems to be a question regardless of whose system is used. Full metallic service is the only one near perfection. Common return is bound to be more or less troublesome and noisy and abounding with cross talk. Undoubtedly purely metallic service would be better than common return. Not that transmission is better, but general conditions are certainly more favorable to perfect service.

I would like to see a diagram of the duplex coil, and its use, and whether it can be used on a grounded bridge circuit. We have a private line, forty miles in length, which runs parallel with lines of the same kind. This is a private line for a banking firm, and we want some way to prevent cross talk with those two banks.—R. J. S.

A coil as used for duplexing purposes is shown in Fig. 4. It is an ordinary repeating coil, with the windings split, so

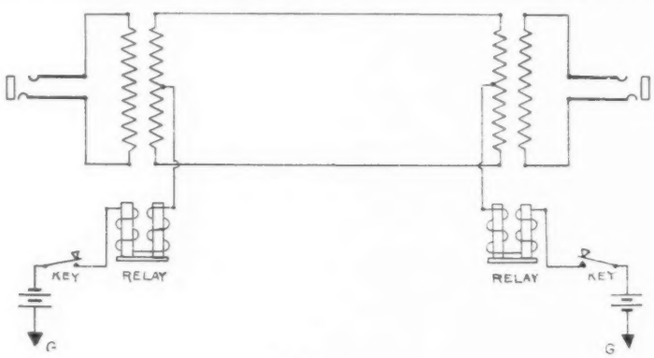


FIG. 4.

that the coil may be tapped at the middle point. Supposing that the metallic circuit were used for telegraph purposes, the middle point on the outside half of the coil would be connected through the telegraph instruments to ground. The wave, passing through the halves of the coils in opposite directions, has no effect upon the iron core of the repeating coil, and consequently no sound is heard from the telegraph ticking. If used for talking purposes, then according to Fig. 5 a telephone would be tapped at the middle points, now making one metallic line and one grounded line out of the same pair of wires. For relief, you could take the single bank line, and one of the other lines, and make it one metallic line. Then place the duplexers, and from the middle points of the coil attach the banks on this new metallic circuit.

This is shown in Fig. 5, in which the two lines have been made into one metallic line. At each end of the line are placed the duplexers, D1 and D2. At points *x* and *y*, are connected the bankers' telephones. At the ends are the telephone stations, or drops, at the end of the forty-mile line. This method of connection may be more prolific of cross talk than the old way. The two lines must be of same size and resistance, in order to operate with the duplexer. Only perfect balance will result in absence of cross talk. If there are more lines, then the banks should be at the ends of the metallic line, and the parties, whose line has been used to complete the metallic line, should be tapped on the middle points. Then no one could hear the bank, nor could the bank hear anyone, of course, providing that a fair balance of the lines is obtained.

We have different ideas as to a true metallic line, and how to put in perfect transpositions. Please explain as to a perfect metallic line, and perfect transposition.—H. K. T.

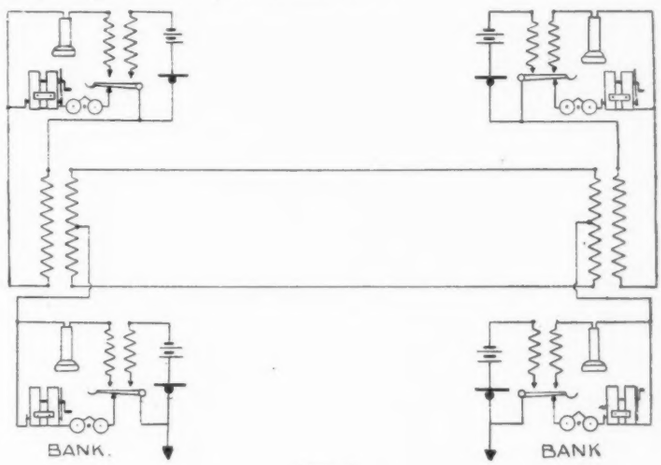


FIG. 5.

A metallic line is one that is free from ground, and well insulated. To have a perfect line, of course, is impossible. It must have equal resistance on each side of the circuit, and must be transposed at exact distances, these according to the inductive disturbances. Just what a perfect transposition is, is doubtful. A line that is well transposed has its transpositions cut in at exactly equal distances. It cannot be one thousand feet at one time, and twelve hundred the next. Each section should be exactly the same in length.

We have lately completed a long distance line from our Cartersville exchange to Richmond, fifty miles, with metallic system, No. 10 E. B. B. wire, with transpositions every half mile. Paralleling this line on the same poles we have along most of the line one or more grounded lines, running into our exchanges and connecting with the long distance line through repeating coils. At Cartersville we have several long grounded lines, which are connected with the L. D. line through repeating coils.

The service, which has just been started, is very poor, even on the metallic line, the transmission being weak, and cross talk very

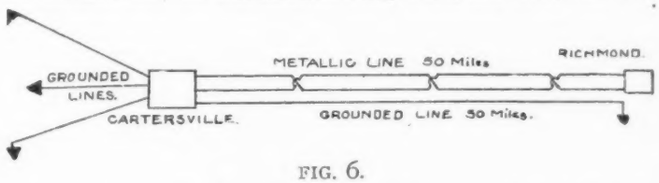


FIG. 6.

bad on the metallic line. The ground lines centering at Cartersville are fifty miles long. Fig. 6 shows the positions of the lines.—C. E. J.

(1) Should we expect cross talk on a metallic line, when not connected with any grounded line, the metallic circuit being transposed every half mile?

If the metallic line is not balanced, that is, having the same resistance on each side of the line, any number of transpositions will be of no avail. A series telephone placed on one side of the metallic circuit would be an example of an unbalance. Line joints are of unequal resistance, and these may contribute to the trouble. I know of copper lines, supposed to be put up in the best of shape, circuits 560 miles long, which encounter cross talk difficulties from just one mile of badly distributed transpositions. This one mile of defective transposing affected the whole line, and was even heard by parties connected still 900 miles beyond. A trans-

posed metallic line, therefore, is not proof against cross talk.

(2) With good instruments, should not the talk (but for cross talk on grounded lines) be perfectly good on the fifty miles of metallic line from Cartersville to Richmond?

No. 10 wire has a resistance of 22 ohms per mile. The fifty-mile metallic line would have a resistance of 2200 ohms, which is well within the range of transmission limitations, particularly, for local battery service. By this, I do not mean that common battery will not talk as far as local, when used alike, but line resistance is a great factor in common battery transmission, because the resistance determines the amount of battery the transmitter will receive. But local battery instruments are not affected this way, and should talk through thousands of ohms of resistance in the lines. If the transmission is weak, it looks as if there were too many people listening on conversations, or that a low resistance drop was bridged across the line, or too many low resistance bells.

(3) Should not the transmission be fairly good with the longest grounded line connected at Cartersville with Richmond, 50 miles of metallic and 50 miles of grounded line, the metallic being No. 10 and the grounded No. 12?

A good repeating coil, connecting these lines, would not cut down the talk more than five per cent. If the terminals of the grounded lines are in the best of condition, that is, perfectly well grounded, there should not be great difficulty in being heard. This seems to be a light performance for a good transmitter, with batteries in good condition.

(4) Including four exchanges, and three testing phones on the fifty miles of metallic line with generators which will ordinarily ring on short lines with twenty phones, will they ring satisfactorily from one extreme to the other of the metallic line? If so, will it ring satisfactorily if we add twenty miles more of metallic line with no increase of exchanges and testing stations?

If all the exchange drops are of high resistance, a thousand ohms, anyway, and the testing phones have 1600 ohm ringers, there should be no difficulty in adding the length to the line. If the line is a weak talker, it certainly will follow that ringing is weak also.

(5) Is there any way to get rid of cross talk between two grounded lines?

This seems to be a general question. It stands to reason that there is no way, as long as the earth is used. Nature apparently has not intended telephone people to use the earth for talking purposes. It gives too much interference. Even telegraph lines have trouble from earth connections, and there is no comparison between the sensitiveness of the two instruments, the receiver and ticker.

(6) What can we do to get rid of cross talk between our metallic lines? We supposed that transposing every half mile would prevent it. Should we look for it in the switchboard?

It could be easily tested to prove that the switchboard has, or has not, a part in it. Often cord circuits of switchboards are connected on one side to a common point for divers reasons. By taking an instrument, and cutting off the board suddenly, when the cross talk is noticed, it can be observed where it comes from. The metallic line should be measured to see if both sides of the line are of the same resistance. Then the insulation, regarding the earth, should be tested, and if all good, the transpositions must come in regular order, that is, uniformly, the same distance apart.

(7) When a grounded line is connected to a metallic line should the Richmond talker on the end of the metallic line hear the cross talk coming in from the grounded line to which the metallic line is connected?

He certainly should. The telephone receiver is not a very discriminating thing. It faithfully records all electrical impulses. Cross talk comes from electrical impulses, and it comes in for its share of attention from the receivers.

When cross talk is prevalent on metallic lines, the switchboard should be tested thoroughly. It might come from the line drops, which may be cut off the line while in use, on one side only. If such is the case, then the drops must be shielded from each other, like the tubular drop. Cross talk can be noticed between two lines having unprotected drops partially in circuit, a great many feet apart. If the drops are cut off entirely, and the cord drop left on the cord circuit, then it must be magnetically shielded from all the neighboring drops.

In one of the papers read before a telephone meeting, something was said about the difference between the battery strength needed for local usage, and that used for long distance conversation. It said that if the batteries of a local battery system were made strong enough for long distance work, they would be entirely too loud for local city work. In common battery work it said that the battery for conversation could be made to suit the conditions of either local or long distance lines. How is this done?—W. A. M.

There is no doubt of the necessity of different conditions of local and long distance conversation, up to certain limits. Above fifty-five volts there is no sensible advantage under any conditions. It is easily accomplished, this matter of meeting conditions of local and long distance transmission. The normal battery strength, let us say, is twenty-four volts, that is, normal to the system to be explained. This amount of battery suits local conditions. For that matter, ten volts, or six volts, would satisfy transmission, but there is another condition, that of relay operation. Each local position has from fifteen to eighteen pairs of cords, and these are connected to the twenty-four volt battery. When the subscriber wants the toll board, he tells his operator what he wants with the twenty-four volt battery. But he does not talk to the toll board with that battery, nor does his operator have anything to do with it. She simply depressed an order button, and told another operator, the switching operator, that her party wanted toll. This switching operator plugs into this subscriber's number in another part of the multiple, and steers his call, as it were, to an operator called the recording operator. But on the switching operator's cord circuit some changes have been made. Instead of twenty-four volts existing on the cord, there has been added twelve more cells to the twenty-four volt battery in use on the local circuit, which makes forty-eight volts existing on the switching operator's cord circuit. As all the battery, during conversation on any toll line, is furnished by one of the switching operator's cords, it is seen that every toll connection has a forty-eight volt battery. Now during the day the twenty-four volt battery stands at nearly thirty volts, so that most long distance conversations over the long lines are carried on with fifty-four volts. There may be one hundred local positions, and yet all the long distance business has to pass through the switching operator, so that at no time is there a chance for the ordinary voltage to be used. This battery is not supplied directly to the subscriber's circuit. It passes through nearly three hundred ohms of non-inductive resistance before it goes into the repeating coil windings. Each winding of the half of the repeating coil at the subscriber side, would get battery through nearly 150 ohms. This prevents warming up the coil, and other parts during an accidental short circuit. In an article read before an association a complaint was made that a certain system using forty volts had trouble on long distance connections. From the above, it would seem that general conditions of real long transmission would disprove the statement.

TO UNDRESS AT THE TELEPHONE.

"It's appalling," said an elderly aunt, who was spending a week in town, "to see how they use the telephones nowadays. Only last night, when there was a dinner party on, Mary, who was dressing, answered the telephone which is in her room. And it was one of the men calling her up to say that he had been detained down town and was dressing then as quickly as possible, but didn't want dinner to be kept waiting for him.

"There the two of them stood talking to one another just as if they were entirely dressed and had stopped for a little chat on the street! I tell you this generation is a little too much for me."

Are Country Telephone Lines Profitable.

Paper by A. E. DOBBS.

(Concluded.)

In many cases it happens that the man who builds a town exchange finds that he has been forestalled in the surrounding territory by farmers who have built a large number of private lines and who, as soon as the town exchange is built, will endeavor to exchange free service with it on equal terms, regardless of the fact that connection with the town exchange is a greater advantage to them than it is to the town and that a line built of white oak poles with four-inch tops carrying from ten to twenty subscribers on a single wire will be a constant source of annoyance to the exchange owner.

In many rural communities managers who have already made every possible concession to these people are now threatened with rival exchanges if they do not give absolutely free service, which would bankrupt them to grant. Here is where the ignorance and self-importance of the farmer asserts itself. Having built a cheap line with cheap instruments and cheap labor, he imagines that it costs very little money to build and operate an exchange, more especially as his own line, perhaps not yet a year old, has not yet begun to fall down into the highway, though it sometimes happens that retribution begins from the very day the line is built, as the following amusing letter from a local electrician to a well-known manufacturer shows:

"Some little time ago a lot of farmers nearby concluded to build a telephone system and came to me for advice. Accordingly, I laid plans for furnishing your instruments at $12.50 each and for the construction of a good line of No. 12 wire, broken up into three circuits, and strung on good poles. They laughed at my estimate, saying it was too high, for they had received circulars from another firm telling them that they could construct a line at a cost not exceeding $15 or $20 per subscriber.

"I then made them an offer to build and supervise the construction of the line for the cost of labor and material, plus 10 per cent, but my figures were still too high to suit them. Well! the old saying, that 'Experience is a dear school, but fools will learn in no other,' was well illustrated, for they purchased a lot of 1,000 ohm bridging telephones from a retail supply store at $11.00 each, put up a lot of cheap construction with green oak poles, not a soldered joint in the line, annunciator wire run through the buildings, a two-foot length of No. 10 wire stuck in the earth for a ground connection and thirty-two subscribers on a ten-mile line.

"Of course you can imagine what happened. The line is finished, and not one of these fellows can talk to his nearest neighbor. Besides this line, which was built on the mutual assessment plan, has cost them over $30 apiece and, at the present time, is not worth a d——n.

"They held an indignation meeting last night, agreed that what I told them was true, charged their president who ordered the instruments with swindling, appointed a committee to ask me to take charge of and rebuild the line. It will also be a clear case of my selling some new telephones of your make and altogether it is working out in a manner quite satisfactory to yours truly.

"_____ _____."

It is not often, however, that amateur telephonists are brought to their senses so quickly, but still there is a great deal of missionary work to be done among this class. Just now there is a keen discussion going on among many of the small exchanges of the Western states regarding this class of business. In too many cases they have been given free connections with the exchanges provided they built their own lines, which they have been allowed to build as they pleased. In other cases the farmers have objected to paying fifty cents a month for exchange service and threaten all sorts of things if they do not get a lesser rate.

Now why should they expect to receive free service just because they own a telephone line?

Does the local merchant, who delivers goods to his town customers, sell goods to the farmers at less than cost because they own their own teams and drive into town when they need his wares?

How long can an exchange, any more than a merchant, continue to do business at less than cost?

We must admit that cheap telephones for the farmer are a good thing for the town, but it is a still greater convenience to the farmer himself.

Sometimes local conditions are such that it is necessary or desirable to give free service to the entire county or to certain neighboring towns, but in that case the rate should be made to correspond to the service furnished for a large exchange has to not only serve a larger number of patrons than a small one, but it has to handle more calls per subscriber as well as give instant and continuous service both day and night, all of which costs the management more money per subscriber than in a small plant. But the value of an exchange to its subscribers also increases in proportion to the number connected; they should therefore be willing to pay for the increased facilities offered. As to the cost of operating a small exchange, there are certain items that cannot be dispensed with, such as a manager-lineman, who must be paid for his services as well as two operators. Supposing that they are paid living wages, the cost would be about as follows:

FOR 100 SUBSCRIBERS WITH NIGHT SERVICE.

Manager, per month	$50.00
One operator, per month	20.00
Relief operator	5.00
One night operator, per month	10.00
Total	$85.00
Cost of operation per subscriber per mo.	0.85

With 150 subscribers the above fixed charges would not be changed a great deal, as one operator could take care of that number without difficulty, and therefore the cost of operation per subscriber would be but a trifle over 57 cents per telephone.

With 200 subscribers we may suppose that the lineman's salary will remain the same, but we will have to add $10.00 to the relief operator's salary and $5.00 to the night operator's account, or $15.00, making $100 altogether, equal to $0.50 per subscriber.

With 300 subscribers our account becomes a little larger and would probably be as follows:

FOR 300 SUBSCRIBERS WITH NIGHT SERVICE.

Lineman-manager	$65.00
Two operators at $20.00 each	40.00
Two operators at $15.00 each	30.00
Troubleman (helper)	40.00
	$175.00
Cost per subscriber	0.58

Thus we see that the cost of operating service alone in ex-

changes of this size varies from $0.50 to $0.80 per subscriber per month. This does not, of course, include repairs to line or instruments, depreciation, interest on capital or dividends, which are greater in a large than a small plant.

Now let us suppose that a subscriber is paying $2.00 per month for the use of his telephone. With 100 subscribers he would pay at the rate of $0.02 for each subscriber connected, and with whom he has the privilege of holding communication: With 150 telephones connected, the rate remaining the same, he pays at the rate of 1 1-3 cents per subscriber, while with 300 connected his rate is 2-3 of a cent. Thus we see that while his range of communication has been greatly increased his proportionate rate to the general service has steadily fallen, while the cost of serving the public has, if anything, steadily increased, owing chiefly to the greater length of lines and heavier construction required. Maintenance, cost and depreciation of the plant has been referred to in a former paper, so that we need not dwell on the subject now. The cost of operation is referred to merely to show that unless there were compensating advantages somewhere, connections to farm lines cannot be furnished for nothing, especially when the rural subscribers are in a majority as they frequently are.

OTHER DETAILS.

There are quite a number of perplexing problems in the handling of rural party lines, not the least of which is the question of how they shall signal or be signaled. The ordinary bridging bell is a very simple circuit, but a very annoying one both to subscribers and the exchange.

At the exchange every call sent by subscribers to others on the same line causes the drop to fall and distracts the attention of the operator from other work.

One of the means of overcoming this annoyance most frequently used consists in the use of pulsating bells at the subscriber's stations by means of which all calls are received at and answered by the central office, which of course increases the operator's work, but as the operator has to watch and restore the drop anyhow, very little time is lost and the service is much more satisfactory, especially in exchanges where there are fifteen or twenty party lines.

Another method consists in placing all the bells on one side of a metallic circuit, allowing subscribers on that line to ring each other without throwing the drop in the office, which is connected across the metallic circuit. Should they desire to call the office, they push a button which connects the generator in multiple with the drop, causing it to fall. Of course all conversation is carried on over the line as a metallic circuit which is grounded on one side through the ringers. This is objectionable when connected to long lines, although when used for local service it gives very good results.

Another method lies in the use of biased or polarized ringers which for selective ringing, however, is limited to about four parties on a line, but any one of the four can be rung without disturbing the others. This system, by the use of one, two and three rings can, however, be extended to eight or even twelve subscribers. In the latter case, three bells on the line would ring at one time, the other nine remaining silent. In this system, which is as reliable as any yet invented, a metallic circuit is required which, for ringing purposes, is divided into two parallel grounded lines, two bells being bridged from each side to ground. By the use of high resistance bells, the grounding on both sides of the metallic circuit being equal, a satisfactory balance is secured.

Other systems by which currents of varying strength and frequency are made to operate the different bells are now being placed on the market with very satisfactory results so far as heard from.

It would seem that some form of step wheel system that would throw the telephone into use only when wanted would be highly desirable, but so far none of these systems have secured general acceptance, due, possibly, to the necessary complications of the apparatus used, which has a tendency to make people afraid of it. The advantage of a system of this kind would be in the almost unlimited number of people who might be placed on one line and signaled selectively and the ease of applying a lockout device to keep those not called from listening in.

Whichever system is used, whether selective or not, too many subscribers should not be placed on one line, for it not only creates dissatisfaction with the service, but it cheapens the telephone business by giving patrons the impression of unnecessary economy, and when patrons once get the idea that you do not take the business seriously enough to give them good service they will begin to make all sorts of demands upon you.

When you meet with lines already built acquire control of them in some way, either by offering stock, cash or a lease if they are worth purchasing. If their owners are stockholders in your company they can see where the profits are going and in any controversy with the public you are likely to have the active as well as the moral support of these men, a very important advantage.

Above all, insist on good work and standard construction, for therein lies economy of operation and maintenance.

A TELEPHONE MEETING.

The Chicago Electrical Association devoted its last meeting for the season, which was held at the Albion Cafe on the evening of May 1, entirely to telephone subjects, with the exception of the social features. The attendance was large and the interest of the session was well maintained under the direction of Prof. P. B. Woodworth, president of the association.

H. P. Clausen, chief engineer for the American Electric Telephone Company, delivered the principal address of the session, dealing with the history and recent developments of party-line telephony and especially with selective signaling. The subject was covered fully and in detail, and proved deeply interesting. Certain points were elucidated by the help of demonstrations.

Chas. H. Roth explained the action of the Roth motor-generator employed in the experiments, and M. W. Zabel discussed the limits and range of high and low-frequency work. Prof. Carl Kingsley, of the University of Chicago, spoke at some length, and was followed by W. F. Zradolph, who resumed the subject of the plus and minus system of signaling.

The association will hold its next meeting at its rooms in the Monadnock building on Friday evening, October 2.

FINDING A POLICEMAN BY TELEPHONE.

The problem of finding a Fostoria policeman by telephone has at last been solved by science, assisted by Prof. J. C. Rhodes, manager of the Citizens' Telephone Company of that city. It is not to be inferred that Fostoria policemen are never to be found when wanted, but that the town is large, the telephones many, and the policemen few. Rhodes has rigged a red light on the top of the loftiest telephone pole in the city, the one at the intersection of Main and Tiffin streets. It is an electric light and is operated from the telephone exchange. Whenever anybody wants a policeman, the telephone message to central results in a call to the police station, and at night in addition the switching of the current into the red light. The police officers approve of the device and at night go around with their eyes cast heavenward. A city officer humorously charged Prof. Rhodes with omitting an important part of the apparatus. "What are you going to do if the policemen are sleeping?" was his objection.

Independent Telephone Systems.*

By J. J. NATE.

It is only necessary to look over the immense mileage of toll lines constructed by the Independents and the network of wires that cement together interests in communities which for over twenty years have been denied the use of the telephone to appreciate what has been accomplished. Experience shows that in toll-line service eighty per cent of long-distance conversations are carried on within a radius of fifty miles from any given center, and the Independent companies are supplying this service at five to ten cents a connection. Ten per cent will cover long-distance service within a radius of 200 miles, and the remaining ten per cent will fully take care of extremely long-distance work. The Independent companies have constructed in the central Western states more miles of toll lines; established more toll stations and extended service to more farmers and rural communities than the Bell company has; and all of this has been accomplished in a manner which is surprising indeed to one not conversant with the Independent telephone companies' progress since 1894.

A paper was read recently at a convention in Indiana which demonstrated clearly that in one section of the country the Independents had upward of 17,000 telephones in operation, where originally the Bell company had supplied less than one hundred telephones, practically furnishing no service whatever. As very little toll-line construction had been attempted by the Bell company, there were thousands of people in the state of Indiana who had never talked over a telephone previous to the expiration of the Bell telephone patents. I remember installing a telephone exchange of about one hundred numbers in Monticello, Ind., in 1895. At the completion of the work a telephone concert was given over the wires and the entertainment was a nine days' wonder. There were many people in that town who did not understand the value of a telephone. To-day Monticello is giving service to 300 subscribers or more.

It has been in exchanges of this character, or with a list of subscribers ranging anywhere from 100 to 500, that monthly rates of $2.50 per month for business telephones and $1.50 for residence telephones, with individual line service, has been found extremely profitable. There are even instances on record wherein conservative management and good construction has netted the investors approximately twenty-five per cent on the investment. This would mean that the property paid for itself within four years. This statement does not compare favorably with the Bell company's claim that "Depreciation is so great that Independents cannot exist at the rates charged," while at no time has it been claimed that depreciation is greater than ten per cent. This rate of earning would enable owners to rebuild their plants after five years and still profit by at least ten per cent on their investments. I admit that it would be better to declare dividends and increase the capital stock for the purpose of making extensions; but the work has been new to the Independents, and its magnificent future possibilities were until recently undreamed of. From the list of cities shown in May TELEPHONY in which Independent plants are in successful operation, the present partial list is selected to show that Independent operators have found the service profitable and appreciated by the people:

Anderson, Ind.; Ashland, Wis.; Alpena, Mich.; Hyde Park, Ill.; Cumberland, Md.; Clinton, Ia.; Delaware, Ohio; Duluth, Minn.; Ft. Wayne and Kokomo, Ind.; Lincoln, Ill.; Mankato, Minn.; Mishawaka and New Albany, Ind.; New Philadelphia, Ohio; Ottumwa, Iowa; Parkersburg, W. Va.; Rochester, N. Y.; St. Paul and Minneapolis, Minn.; San Antonio, Texas; Cedar Rapids, Ia.; Clarksville, Tenn.; Joplin, Mo.; Lima and Newark, Ohio; Paris, Kentucky; Columbus and Canton, Ohio; Charleston, W. Va.; Jackson, Mich.; Logansport, Ind.; Madison and LaCrosse, Wis.; Asheville, N. C.; Birmingham, Ala.; Springfield, Mo.; Texarkana, Texas; Alexandria, Ind.; Dennison, Texas; Elwood, Ind.; Jackson, Mich.

In many cities in which to-day is installed Independent telephone apparatus bitter fights were waged for several years before the city councils, and during this time the Bell influence was strong enough to offset the work of the Independents; but perseverance finally succeeded, and while in every instance the Bell, through some of its well-known methods, was successful in delaying matters, it was only temporarily. I cite a few cities in which immense sums of money were spent by the Independents in their endeavors to secure franchises, and which to-day would be without Independent service if it were not for the fact that the citizens themselves took hold and helped the measure through. I have in mind such towns as Rockford, Moline and Rock Island, Ill.; Davenport, Iowa; Sioux Falls, S. D.; Asheville, N. C.; Aurora, Elgin, Joliet, Peoria and Springfield, Ill.; St. Paul and Minneapolis, Minn., and, in fact, a great many other cities in the Independent field.

For the further purpose of strengthening the arguments which I have advanced I propose to conclude this paper with statements which are based on accurate information furnished at my request by the different exchange-operating companies, with a few possible exceptions where conditions will be dealt with generally. I have also at hand many strong, characteristic letters, from which I shall quote quite extensively, for there can be no stronger evidence of the success of the Independent movement than the testimonials which come to us from the actual user of the telephone.

ASHEVILLE, N. C.—An interesting bit of history in connection with this exchange which is not generally known relates to the active measures taken by a committee appointed by the city's board of trade to investigate the telephone situation as to rates and class of service furnished. This was previous to the installation of the Independent company's plant. The general manager of the Asheville Independent company's exchange has very kindly furnished me with a copy of the report submitted by the committee about a year ago, and published at that time in the newspapers of Asheville and in other prominent papers throughout the state. The report is clear and concise and states all the facts. The Bell company at the present time are maintaining an office, handling probably less than fifty subscribers, and have offered their manager a small salary per month plus the receipts of the office, which would indicate a sorry state of affairs indeed. The home company has within the last few months rebuilt its Henderson exchange and will add many new subscribers this summer. Mr. W. S. Proctor in referring to the report, concludes: "So you see we are still in the ring, notwithstanding the fact that the Bell has put in a common-battery plant and has offered free service to any one who would take it." The committee's report is in substance as follows:

To the Citizens of Asheville: The board of directors of the Asheville board of trade, feeling that the public should be kept fully advised on all matters coming before us in any way affecting the public interest, desire to submit the following statement in regard to the telephone situation here:

About three years ago the board of trade, after consultation with the city officials and many other prominent citizens, undertook to arrange with the Southern Bell Telephone Company for a better service at prices something like other towns and cities were pay-

*This is the third of this series of articles by Mr. Nate.

ing. At the time these negotiations were begun our telephone service was so bad that public patience was well nigh exhausted. This work was felt to be so important that a special committee was appointed, designated as the "Telephone Committee of the Asheville Board of Trade." The committee was selected with the greatest care, and began its work with a well-defined purpose of securing for Asheville a first-class telephone service, at a fair price, and to avoid if possible the burden of a double system. The committee very naturally and properly took the matter up first with the Bell Telephone Company, who was in a position, if disposed, to give a first-class service at a reasonable cost.

The committee in all of its negotiations with the representatives of the Bell company was particular to avoid anything like arbitrary measures or threats, being especially desirous of inducing this company to accede to what was believed to be a fair and just arrangement, at the same time informing them that neither the service nor the charges were satisfactory to the citizens of Asheville, and that the committee was created by reason of the public demand made on the board of trade to use its influence for better service at more reasonable rates.

A proposition was submitted by the committee to the effect that if the Bell company should give first-class service at $30.00 per business and $24.00 per residence telephones, the board of trade would pledge the support of the Asheville public and use all its efforts to protect the city from being afflicted with a double system. This proposition was made after a thorough investigation by the committee of telephone service and conditions in other towns and cities, and was believed and has proved to be fair and liberal.

Every proposition and suggestion submitted by the committee was arbitrarily rejected and the committee was given to understand that the Bell company laid but little stress upon the influence to be exerted by the board of trade or any other united effort of the citizens of Asheville, and that it was only a question of time when all such influences could be overcome.

Failing in all its efforts to secure from the Bell company even an intimation that we should have a better service or a reduction in rates, the committee reluctantly but with determination set about to secure the object for which it was created. viz: a telephone service of the first class at a fair cost.

After a thorough investigation of the various systems and months of hard work, a contract was made by the board of trade with the Asheville Telephone Company to install a system. It was estimated that with the official endorsement of the board of trade and the prices named, about 350 subscribers might be secured.

The people of Asheville are familiar with the facts in regard to the phenomenal growth of the telephone system here. The company began the installation of their plant October 20th, 1898; on the first of March, 1899, they were giving service to 350 subscribers. On the 1st of June, 1899, the business had increased to about 450, and at this date to 1,030. The company now has orders for about 100 telephones, which will be put in as rapidly as possible. Free telephones have been placed in the city hall, at the waterworks, filter, mission hospital and city schools.

Toll lines have been built to all towns within a radius of forty miles, about 300 miles in all. In 1898, when the committee began its work, the following prices were being charged for telephone service here: business telephones $40.00, residence telephones $30.00. Taking these figures as a basis for comparisons, together with the number of telephones now in use, shows a saving of $15,206.00 to the citizens of Asheville.

One can readily see that with an increase of business so far beyond any expectation, it has been impossible to give the service that could have been given with a smaller business. During this trying ordeal the company has been confronted with two problems, viz., to meet the demand for new telephones and at the same time give a satisfactory service. We believe it took the proper course to best satisfy the public in supplying telephones, although at the time being at the cost of an inferior service. With the system completed as it now is, we believe we shall have one of the best services in the country.

Competition almost universally works to the good of the public. We believe and have a right to expect that every patriotic citizen of Asheville will show by his acts his appreciation of the committee's work.

ABERDEEN, N. D.—Before the Dakota Central telephone lines were established there were practically no Bell telephones in that territory. The Independent company now has about 3,000 miles of line, mostly grounded, and about 500 miles of copper metallic lines, together with thirty-six Independent exchanges ranging all the way from 50 to 600 subscribers. The rates charged are eminently reasonable, and the investment represents $250,000—not "watered," not bonded, and out of debt. This company is operating a large system. The people in the company are well satisfied; the capital stock is not on the market, although purchasers are earnestly seeking the company's shares as an investment.

ALBANY.—This company is getting very nicely started, and now has between eleven and twelve hundred telephones in service. Conditions in Schenectady are similar. These plants are of A1 construction, and there is absolutely no question as to the high class of service furnished and the magnificent future before them. It is only necessary to note the list of names of the larger cities supplied with Independent apparatus throughout New York state to appreciate the fact that Albany occupies the center of a very large tributary territory.

BISMARK, N. D.—When the Independent exchange was installed in August, 1901, there were no Bell telephones in service, and this is true to-day. The Independent exchange now numbers nearly 300 telephones, a percentage of about one telephone to every ten inhabitants. Long-distance lines are to be constructed this summer, and it is the hope of the company that it can arrange with the Northwestern Bell for this service. Edward S. Allen, president of the local company, referring to this matter, says: "Their plan is not to contract until the local connection will use the Bell transmitter and receiver, and that I will refuse to do." This is particularly encouraging in view of the strenuous efforts the Northwestern Bell has made to induce the Independent companies to furnish service while compelling the rental of its transmitters and receivers.

BLUFFTON, IND.—Mr. Hugh Dougherty, one of the most persistent and active telephone workers, and a prominent man in the Independent field, writes under date of April 4th, as follows: "The Bell company has no exchanges where we are except at Marion, Ind. We have exchanges at Bluffton, Montpelier, Hartford City, Geneva and Upland, without any opposition. At Marion, where this company bought the plant eighteen months ago, the Bell had 960 and our company 572 subscribers. We now have 1,150 and about 300 on the waiting list. They have a little over 500 telephones in service. The 5 per cent gold bonds issued by this company falling due in from one to twenty years were oversubscribed within three days, and within the territory where our plants are located."

BOISE, IDAHO:—Chas. F. Neal, secretary of the Idaho Independent Telephone Company, writes with regard to printed matter distributed by the Bell company. He states: "In this section of the country the Bell company get out some kind of a fake on an average of once a month, so we are used to them out here." In Boise the Bell company announced in a little circular under date of January 1, 1900, that rates in that city on and after that date would be $4.00 per month for residence and $7.00 per month for business telephones, payable quarterly in advance. This circular was sent out some time in November, 1899. After about fourteen carloads of poles had been unloaded by the Independent company the Bell company instead of maintaining the rates advertised, reduced residence telephone rental to $3.00 and business telephones to $5.00. Before the end of the year another proposition offered free residence service for one year providing the subscriber would sign for two years and pay for the second year. Other propositions followed to prevent the local company from obtaining a foothold. At the present time the Bell company is asking rates not to exceed $2.00 per month, and a greater portion free. If a man takes a business telephone they give him a residence telephone and so on.

The Boise Independent company is controlled entirely by local capital, and has paid 6 per cent annually, using the remaining profits for extensions of the plant. The toll business is exceedingly good.

CLEVELAND, OHIO:—For many years this important stronghold of the Bell company been slowly giving way to the onward march of the Cuyahoga Telephone company, who began service several years ago. The switchboard installed at that time was constructed with a view to an ultimate capacity of 20,000 subscribers. To-day there are over 10,000 Independent telephones in operation in Cleveland,

with a daily growing list of new subscribers. Had it not been for certain financial difficulties experienced by this and other sub-companies a few years ago, Cleveland could probably boast a larger list of subscribers than the Bell company.

ATLANTA:—The Atlanta Standard Telephone Company of Atlanta was one of the early pioneers in the Independent field in the South. It was one of the first companies to install a large switchboard in which some provision was made for a considerable future growth. The earnings were not consistent with the outlay and cost of construction, and recently the company was purchased by the bondholders and reorganized. A contract has since been placed for a modern equipment throughout. The work of construction, both underground and aerial, has been going steadily forward for the greater part of two years, so that within the next few months Atlanta can boast of one of the finest Independent telephone plants in the country.

BALTIMORE:—Baltimore is one of those unfortunate points in the Independent field which have undergone the experience of a first failure and yet are on their feet steadily forging forward to-day. The reports received from the local company indicate a healthy growth.

BIRMINGHAM, ALA.:—The People's Telephone Company found in its first installation that the rates charged for service were not consistent with the cost of construction, maintenance and operating expenses. This plant soon went far beyond the original estimate as to future needs, and while it is often stated that the city council has been petitioned for relief from the maximum rate of the first franchise, this relief was sought and granted in order that the company might reconstruct its plant, install modern apparatus and furnish up-to-date service. The promises made by the People's company are fulfilled in the magnificent reconstructed modern plant now in operation in that city, and the excellent service furnished.

BUFFALO:—A year ago the Frontier Telephone Company was organized for the installation of an Independent system in that city. No stronger evidence of the successful work of the Independents is required than that which can be found to-day in the situation at Buffalo. Right in the enemy's camp, in opposition to one of the most successful plants, the Frontier company has practically completed its plant and is furnishing service of the best character to nearly 10,000 subscribers. It would be idiotic in this age to assume that the men who have financed such a proposition have not investigated carefully the merits and possibilities of Independent telephony.

CHICAGO:—In this city there is at the present time, and has been for several years, a plant at Hyde Park operating under a franchise controlling the territory south of Thirty-first street. In the city proper the Illinois Telegraph & Telephone Company has constructed upwards of fourteen miles of underground tunnels paralleling the streets in the principal parts of the city. A franchise was granted to connect these tunnels by proper ducts with the different buildings along the line of the tunnels. The company that will furnish the apparatus claims to be installing over 10,000 equipments and expects to be in full operation by the first of October, 1903.

DELEWARE, OHIO:—The Citizens' Telephone Company is one of those progressive and successful Independent plants which have gone steadily forward to success. It originally installed in February, 1898, a magneto system with about 150 telephones. The plant grew steadily, and the capital stock was increased from time to time until in 1902 it reached $100,000, subscribed and paid in. The company has paid 6 per cent dividends, and has on hand a large sinking fund drawing interest, with no bonded indebtedness nor outstanding accounts except current ones. Within the last few months it has installed a complete new multiple common-battery system, and is furnishing service to 900 subscribers, with contracts on hand for 200 more. Rates are reasonable, but conservative management from the beginning has made this one of the most successful plants in Ohio.

DEVIL'S LAKE, N. D.:—The Devil's Lake Improvement Company recently purchased and reorganized a plant which has been in operation there for some time. This plant will unquestionably grow to 400 subscribers within the year.

DES MOINES:—This plant will be dealt with more directly later on. It is one of the few instances in telephone history of the installation of a large mutual or co-operative plant. The rates were therefore established without a view to profits. It was estimated in the beginning that perhaps 1,000 telephones would be the maximum, and if this estimate had proved true, the company would not have found it necessary to petition the city council for an increase in rates in order to take care of the hundreds of applications on file. The company is at present laying plans for a complete reconstruction of its plant and the installation of a modern system.

DULUTH:—This company, after about two years of opposition, met with the added misfortune of loss from fire, which destroyed its switchboard. If any one is disposed to question the energy and push of the Independents, here is a striking illustration. Within practically twenty days from the date of the total destruction of the Duluth switchboard a new one was in its place and in full operation.

EAST LAS VEGAS, N. M.:—The Las Vegas Telephone Company is another successful Independent plant competing with the Colorado Telephone & Telegraph Company, which managed to furnish service to about thirty-five subscribers up to 1895. The Independent company is now furnishing service to approximately 400 subscribers. The Bell has cut below the rates of the Independent company, but has not been successful in gaining the confidence of the people. This is not to be wondered at when one stops to consider its former rates of $80.00 a year for business service and $50.00 for residence. The Bell rates now are $24.00 and $12.00 respectively.

FINDLAY, OHIO:—The Findlay Home Telephone Company is now being managed by Irving W. Pope, who formerly held a prominent position with the Bell company. He writes with regard to the situation at Findlay as follows:

"As near as I can find out, we had in the neighborhood of six hundred and thirty-five subscribers when we commenced business July 1, 1901, and the Bell had about 950. We now have a subscription list of very close to 1,100 and the Bell very close to 1,200. Our rates are much the better and our service is thought the better by the people at large. I think our service here is the best given by any exchange of its size, or, I might say without exaggeration, twice its size as far as I know. We were lately able to increase our residence rates, which has put us on a sure financial basis. We are installing over fifty telephones each month, and are receiving more orders than we can possibly handle, all without solicitation or advertising."

FALL RIVER:—The Independent exchange installed here some years ago has been growing rapidly, and it is only a question of a year when other exchanges shall have been installed in the New England states. Then Fall River will be one of the prominent plants in the East.

(Concluded in July number.)

The Utah Home Independent Telephone Company, of Salt Lake City, has purchased the business property known as the old city hall corner, facing on State and First South streets. The purchase was made from the city, the consideration being $48,000. The site has a frontage of 129 feet on First South street and 153 feet on State street.

The company asserts that it will erect a three-story fireproof brick, stone and steel building on a portion of the lot, and that work will be begun at once. This proposed building is to be the home of the company's central offices and will cost in the neighborhood of $100,000. A switchboard of 12,000 capacity will form part of the new equipment.

Telephony.

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A GREATER NATIONAL ASSOCIATION.

The leading men in the Independent telephone movement openly express the opinion that the one thing most essential to make Independent telephony successful in every sense of the word is a soundly established, loyally and unitedly supported and properly managed greater national association.

These Independent leaders, while paying high tribute to all that has been accomplished by the present national association under the able guidance of James M. Thomas and his associates in this work, more especially as shown in the magnificent fight with the Berliner patent, believe in the immediate formation of a more powerful organization along lines that will appeal to every broad-minded, practical, progressive and successful worker in Independent telephony. Then, if such be the wish of the present national association, it can be absorbed by the new organization.

Counting its members by the thousands and with one or more salaried officials devoting their entire time to promoting the best interests of its members, this new organization should wield an influence of incalculable value.

These leading men state that there is no more convincing evidence of the magnitude of the Independent telephone movement as a whole than is found in any issue of TELEPHONY. For the stability and progressive growth of the manufacturing and industrial branches are reflected in the advertising pages, while the reading pages portray the practical faith of capitalists who are supplying the sinews of war to build a complete, comprehensive and interconnected Independent telephone system that shall truly rival the Bell in every sense of the word.

If an industry of such magnitude, having a scope so comprehensive and possessing so marvelous a vitality, can be built up under the most discouraging circumstances, what may not be achieved under intelligent, energetic and determined guidance.

There is pressing need of fifty millions of dollars for immediate investment in the Independent field, and there is ample room for a hundred millions more. With a powerful organization guided by master minds, the Independent movement will be placed on a more stable and permanent basis.

THE INTOXICATION OF SUCCESS.

The progress of Independent telephony has been marked in the past by such signal success that one is apt to forget that it is a business, like any other, amenable to the same rules and liable to the same dangers.

Some are going too fast. All would do better if they stopped a moment to consider seriously the future. That the end is near no one believes. If it were possible to conceive of every American home and place of business furnished with a telephone, there would still be the entire world besides to supply. It is not the danger of overproduction that menaces. It is the danger of overconfidence. There will be no failures by reason of lack of a market for telephone goods or service, but there will be failures if men undertake to enter the telephone business without a full and comprehensive understanding of what it involves. TELEPHONY does not believe there will ever be an Independent telephone trust. The American people are not accustomed to exchange one master for another equally tyrannical; the Independent telephone movement will always be Independent in fact as well as name. But there should be co-operation and a spirit of mutual helpfulness, if the highest measure of success is to be achieved.

It is unwise to delude one's self into the belief that there are no dangers. The surest preparation for victory is to

anticipate defeat. In the flood tide of present prosperity one must not forget the lessons of the past, if one would rightly foretell the future. Manufacturers of apparatus must build on merit if they would hold their trade. They must know what they sell. Exchange managers must learn the lesson of economy in operation, and the eternal folly of poor original construction. All must be conservative.

We believe that if a panic were to sweep over the United States the Independent telephone movement would be the last to suffer. It is nearest to the fundamental source of things. But even if we believe it, there is no reason why we should court disaster by unpreparedness. We must be ready for whatever comes. In another year we shall be in the midst of one of those political convulsions which every four years stir the waters of American life to the very depths. A day, a week, may change the destinies of nations. What may not a year bring about!

The Independent telephone business needs conservatism. The boom has come, and now that we are being whirled along swiftly by the current, we must not fail to guide our craft, eventually into the quieter waters of safety and calm.

A fairy edifice, resting on the shifting sands of chance, will fall and crumble in a night. It is easier never to have had than to have had and lost. Those men who have built strongly and wisely from the first need have no fear. But there are those who have not been so prudent. To them we say, begin, and begin now, to strengthen your house. If no peril comes, you have lost nothing; the consciousness of safety is enough compensation in itself, for what the extra effort and investment will cost, and if a real danger menaces, you will be ready.

Beware of the intoxication of success.

THE IDEAL PRESIDENT.

Independent telephone men need neither the type of man classed as the reformer or the radical in the presidential chair of the proposed greater national association. They need a man who has courage and wisdom, and who shall determinedly and intelligently work to build up an association mighty in membership, but mightier far in the potency of a unity in aim and in purpose that shall permeate the movement in its every phase, and stimulate each and every Independent to greater achievement.

To-day Independents need for their chief executive a captain of industry, a man of affairs, accustomed to large undertakings; a man who can comprehend the magnitude of a movement calling for new construction aggregating in cost more than fifty millions of dollars each year; a man who can diplomatically impress the fact upon the minds of his followers that Independent telephony is no longer provincial in growth and attitude or sectional in scope, but that it is of the people and for the people throughout all the land that lies between the unsalted seas and the Rio Grande, the Atlantic and the Pacific.

NO PUNISHMENT TOO SEVERE.

Whether a new national association be organized or new life and vigor be infused into the old association, it is our earnest hope that the one action that shall take precedence over all other new business shall be the appointment of a committee authorized and empowered to take testimony and to publish broadcast the facts in every case investigated where a so-called Independent company has built a second Independent exchange in a town or has paralleled an existing Independent toll line, at any time during the past twelve months, or, if thought best, since January 1, 1902.

For this invasion of territory already occupied and operated by Independents, doing untold injury, no punishment can be too severe where the invasion was without cause and deliberately planned. And no mercy should be shown to those who, while claiming to be Independents, continue this destructive form of guerilla warfare. We earnestly hope that a committee will be appointed, composed of men of courage, who will honestly and justly analyze all the evidence submitted, and having reached what they believe to be a true understanding in each case submitted, will publish the same, to the end that further work of this character may cease, and existing investments be safeguarded.

A NEW FIELD FOR THE TELEPHONE.

In supplementing and displacing the telegraph in the work of train dispatching, the telephone is entering a field that promises greatly to broaden and to make vastly more intimate and important its connection with the varied operations of modern civilized life. It may be premature at this time to predict that all such service will ultimately fall to the lot of the telephone; but it is difficult to discover any excellence in the telegraphic dot and dash great enough to counterbalance the advantages of direct transmission of the human voice. The question has already been quite thoroughly discussed, and the superior qualifications of the telephone generally admitted. Three of the foremost railway systems on the continent are in process of telephonic equipment, and the idea is acquiring a momentum that presages an epoch-making phenomenon.

An equally important phase of this nascent expansion is the increasing use of the telephone in street-railway dispatching. For this class of work the inferiority of the telegraph is still more apparent. To require each of the several hundred motormen or conductors employed on the trolley systems of a great city to be able to receive and repeat orders by telegraph would be asking the impossible. With the advent of the telephone, however, all that part of the difficulty is eliminated, and the problem of dispatching becomes a mere question of making up train-sheets.

When the colossal extent of the railway and trolley enterprises of the country is considered, it will at once be seen that the resulting stimulus to be expected in all lines of telephone work is enormous. In fact, so great are the possibilities, there is no adequate basis upon which to estimats its future magnitude except the history of the telephone industry itself.

THE NATIONAL ASSOCIATION.

During the past year adverse criticism of the Independent Telephone Association of the United States has been made by men whose position and influence in the Independent telephone industry entitles them to a respectful and attentive hearing. These criticisms have been based, generally speaking, upon the idea that the National Association has outlived its usefulness in connection with the original purposes of its organization and has become a mere derelict upon the ocean of Independent progress, drifting without aim or purpose and constituting a menace to the very interests it was designed to protect. Some of the criticisms have been good-natured and moderate; many have been caustic and radical. The time has come to try the issues before a national jury of Independents.

The officers and advisory board of the Independent Telephone Association of the United States have issued a call for a national convention of the association, to be held at Chicago, June 24 and 25. It is the business of every Independent telephone man in the United States to be present at the meeting if it is possible for him to get there, and when there it should be his business to decide what shall be the future course of the National Association.

The man who stays at home when he might as well come to Chicago to attend the convention will have no right to raise his voice in opposition or objection, after the convention has adjourned. Much less right of complaint will the man have who does attend the convention, but sits supinely by and keeps his convictions to himself. If the present administration of the association's affairs is wrong or misguided, it is the duty of every man who thinks so to express his opinions honestly and boldly. It is our association, and we all have a right to say what we honestly believe. On the other hand, it is only just to earnestly consider and investigate the other side. The impartial judge must come prepared to waive all prejudice and personal feeling, and to look upon the question of the national association's future with the broad object of the best interests of all concerned, and not with the narrow, restricted purpose of subserving a personal end.

If the National Association has erred, it has been through too close a restriction of its activity during later years, to its original plans and purposes, without giving a due regard to Independent progress. When the organization was formed, the patent aspect of the telephone business was of first importance, and with that problem the National Association began its work and history. That it has fulfilled its original purposes in this regard, no one can deny. It has won a signal victory all along the line, and the common enemy of us all, the Bell, lies dishonored and discredited, despoiled of all his erstwhile armor of patent intimidation, vanquished in the field of Independent triumph. There should be gratitude, and lasting gratitude, in all our hearts, to the men who led us in the fight to victory. No subsequent mistakes or faults can dim the glory of that great success.

But this is a progressive world and we may not live in retrospection alone. There is still work to be done, almost, if not quite, as important as the early battle for relief from patent oppression. The Independent movement, which the National Association nursed as a child, has outgrown its parent and surpassed the fondest expectations of all who were present at its birth. Independent telephony is full grown and manly in its strength. It does not need a guide, but it does need a counselor and friend. To that relationship the National Association should be directed.

TELEPHONY, a year ago, insisted that the next national convention should be held in Chicago, that the pulse of the trade might be measured and felt in the business center of Independent telephony. The advisory board of the National Association has followed TELEPHONY's advice, and at the forthcoming meeting invites the freest discussion of all plans for bettering and improving the present situation.

This paper believes that the Independent Telephone Association of the United States should be truly national in organization and sympathies. We believe that the proper course is to enlarge, rather than to limit, the scope of the national association work. In our opinion a strong, vigorous, earnest national association, close to the hearts of the Independent telephone public, will contribute more than anything else to the success of Independent telephony. The patent battle is practically over, and the original plans of the association have been carried out to successful fulfillment. As a political party cannot live upon a dead issue, so the National Association may not survive simply for the honors it has won. There must be a reorganization of its work and an incorporation of the new ideas of usefulness.

If every Independent state association will see to it that a representative attendance is secured at the Chicago convention, the voice of the telephone field will be heard and understood. Do not let the National Association die of neglect. It deserves to live and increase in influence. Put your shoulder to the wheel and push.

A kicker, who does nothing but kick, accomplishes little or nothing. Don't shirk your part of the work. It is your duty to help. Join together and we shall have a new association which will perpetuate the glories of the past and be a guarantee of the successes of the future.

INEFFICIENT OPERATING.

Probably no phase of the troubles incident to the use of the telephone is more noticeable to the subscriber than inefficiency in the handling of calls, as it causes delays in getting the desired number, resulting in the loss of time that in many cases is valuable.

From a neighboring city we have complaint on this score set forth in a leading editorial from one of their papers. This complaint is based on the alleged unwillingness of the force to give their best attention to the business they are supposed to transact and offering to cite specific instances of willful neglect of duty.

The city in question is not the only sufferer from the same complaint, as our city service leaves much to be desired in the matter of courtesy of operators, and TELEPHONY could give many instances, of which one will perhaps suffice: A certain office called for a given number located in the same exchange, and the calling party remained at the telephone twenty minutes, being told some eighteen times that the line was busy, when in reality such was not the case, and all this because the operator would not make connection until she was told who was wanted at the other end and the desired telephone was not on a party line. Statistics drawn from several hundred calls where the records were kept for this paper shows a state of inefficiency in service in Chicago that is astonishing. Attention to the wants of subscribers is so desirable if one would have them satisfied that it is surprising the local management has been so extremely lax in the matter of discipline.

CHICAGO MEETING OF THE INSTITUTE.

On May 19 the Chicago branch of the American Institute of Electrical Engineers held its telephone meeting, which was well attended and was an important one, the Independent side being more fully represented than at meetings held in the past. William W. Dean of the Kellogg Switchboard and Supply Company presented as his subject "A System of Selective Signaling for Telephone Lines," illustrating with a central office station with four instruments on a single line.

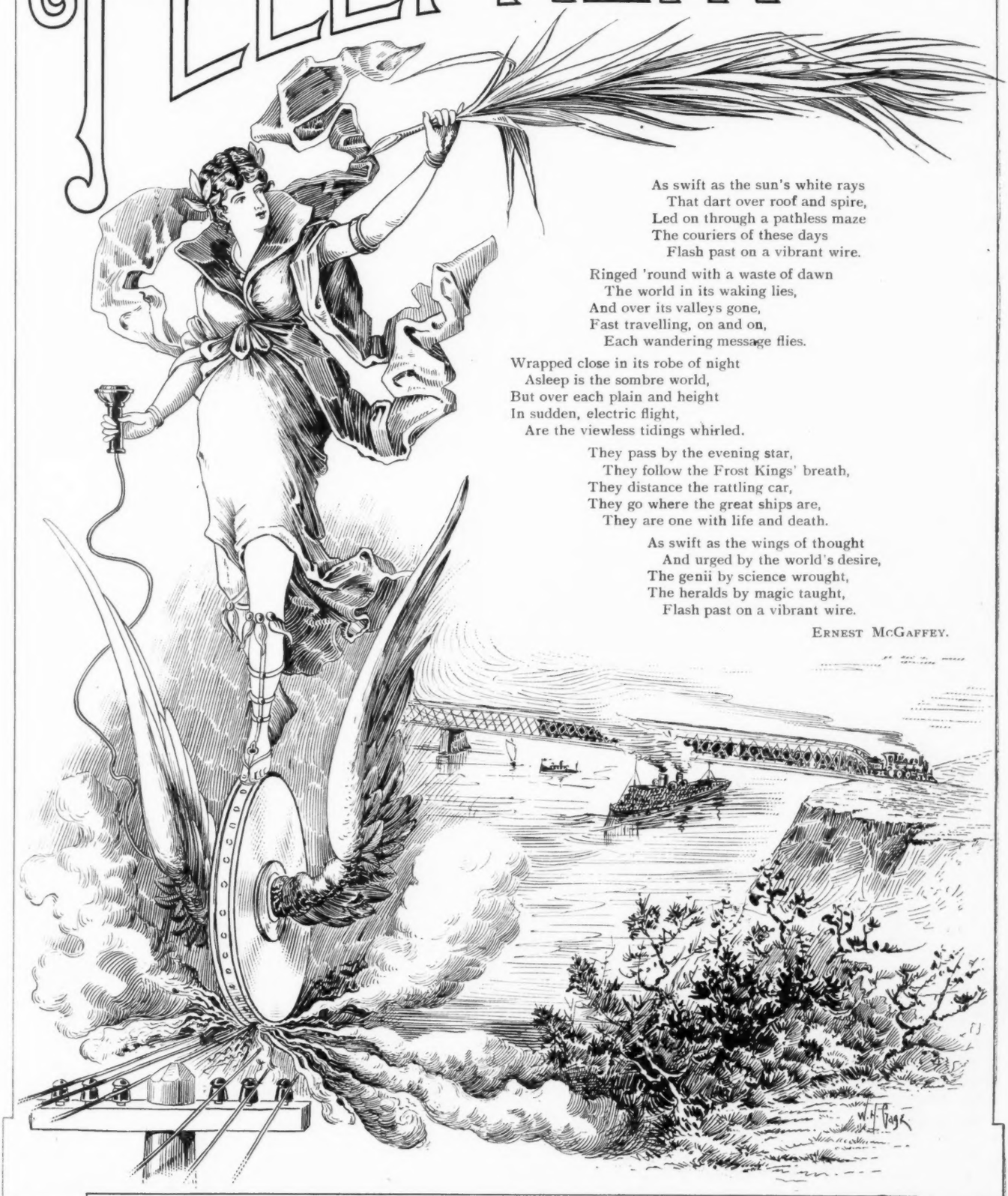
S. G. McMeen of the Western Electric Company read a paper entitled "Concerning the Telephone Engineer," outlining the field of the engineer and demonstrating the necessity of being a specialist.

"Some Features of Telephone Traffic and Their Effect Upon Service" was the subject chosen by J. G. Wray. This paper showed the necessity of co-operation between the company and the subscriber and the adoption of a system whereby operators should be classified.

After the formal business had been transacted the members dispersed to meet again some time in the fall.

On one of the rural party lines the manager in looking up a case of trouble walked into a farm house and discovered a lady sitting in a rocking chair—busily knitting—and with the telephone receiver tied to the back of her chair where she could hear all that was being said over the line. She was irritated when censured, saying by way of defense that she paid for what she got and was bound to get her money's worth.

TELEPHONY



As swift as the sun's white rays
That dart over roof and spire,
Led on through a pathless maze
The couriers of these days
Flash past on a vibrant wire.

Ringed 'round with a waste of dawn
The world in its waking lies,
And over its valleys gone,
Fast travelling, on and on,
Each wandering message flies.

Wrapped close in its robe of night
Asleep is the sombre world,
But over each plain and height
In sudden, electric flight,
Are the viewless tidings whirled.

They pass by the evening star,
They follow the Frost Kings' breath,
They distance the rattling car,
They go where the great ships are,
They are one with life and death.

As swift as the wings of thought
And urged by the world's desire,
The genii by science wrought,
The heralds by magic taught,
Flash past on a vibrant wire.

ERNEST MCGAFFEY.

PRACTICAL TELEPHONY

Conducted by P. KERR HIGGINS, A. M. I. E. E.

ARTICLE VII.

Pole line construction divides itself into five important divisions: (1) Poles. (2) Cross-arms. (3) Insulators. (4) Wire. (5) Guying. In general, it may be said that the most expensive part of the plant per subscriber is the outside plant; hence, the importance of constructing it well and at the same time as reasonable as possible. Nowhere, perhaps, can money be wasted as in outside construction, therefore great care should be taken to use only the best material.

Poles.—These are of two kinds, (1) line poles; (2) terminal (or cable) poles. The line poles are those used in the straightaway work and support the wires between the terminal pole and the office or between two terminal poles. They are usually lighter than the terminal poles, because

FIG. 1.

they are not called upon to bear as heavy a strain. It is customary to select the heavy poles for terminals and set them aside for that purpose, iron poles are also used for terminals. All poles should be of the very best quality, live cedar or chestnut. For work in the city the poles should be selected as to straightness, the best being used for street work and the cullings for alleys; the following gives circumference usually demanded by engineers:

Length, feet.	Butt, inches.	Top, inches.
25	33	25
30	34	25
35	36	25
40	40	25
50	50	25

The number of poles along a given route must be a predetermined factor, and is governed by the route and the obstacles met. In toll line work forty poles to the mile is standard, but no definite rule can be applied; on light leads twenty poles are sufficient. An arrangement of this kind enables one to double the poles per mile by setting an additional pole in each span as the number of wires (or load) increases. All poles on being received should be carefully examined and handled with care in unloading. In planning a pole line it is customary to place wooden stakes at pole locations. The size of the pole may be indicated by the color of the stake, and a different color for each five feet; on the stake may be placed the number of cross-arms, etc. In city work this need seldom be done but for toll lines it is found necessary. All guy stubs should be marked and located in a similar manner. In locating poles in the city, in order to retain the good will of the people, it is well not to abuse the privilege of planting a pole, against the will of the property owner, even if the law is on your side. A small piece of cable here and there will be beneficial to your system and avoid conditions as

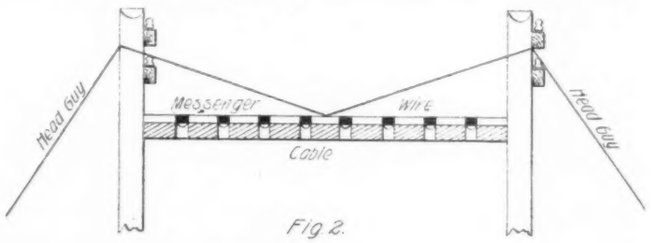


FIG. 2.

shown in Fig. 1, which is an actual condition in a prominent street in Los Angeles, Cal. It will be noticed that on two corners there are no less than ten poles. It is good policy in a case of this kind to make an effort to plant the pole and then make other arrangements, if necessary, installing a short piece of cable and using a longer span as in Fig. 2. In digging post holes, it is well not to leave them open over night, especially in the city, and if necessary to do so they should be properly protected. The depth to which they should be dug for the various sizes of poles is usually as follows:

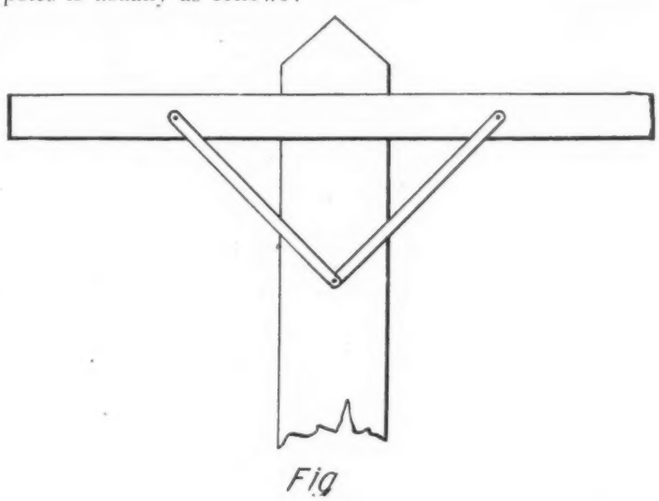


FIG. 4.

Pole.	Soft ground.	Adobe or clay
25 feet.	5 feet.	4½ feet.
30 feet.	5½ feet.	5 feet.
35 feet.	6 feet.	5½ feet.
40 feet.	6½ feet.	5½ feet.
45 feet.	7 feet.	6 feet.
50 feet.	7 feet.	6 feet.

The modern method of setting poles in the cities is by means of a derrick wagon as shown in Fig. 3, which is

quicker and cheaper and less liable to accidents. As a rule, the old method of "picking" is still done on toll lines, although I believe on a heavy lead the derrick wagon would pay. In average soil one man should dig eight six-foot holes in ten hours.

In setting poles at corners, give lean of twenty inches against strain. The distribution of poles is usually done by wagon and the heavy poles are used as terminal poles and for corners. Poles should be set so as to have the cross-arms of the alternate poles face in opposite directions. The pole having been set in place, it should be held there by means of pike poles while the alignment is being made. In cities it is well to thoroughly tamp the ground after pole setting and mix broken stone with the earth, then cement around the pole for about one foot; this usually prevents

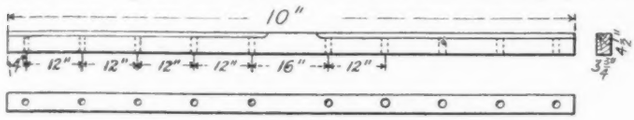


FIG. 5.

caving in and unsightly holes at the base of the pole. The cement should be so arranged as to drain away from the pole. In the country the earth should be banked up slightly so as to throw off the water and allow for the settling of the ground. The setting of poles in river beds, etc., is usually done by placing them in a barrel filled with rock or stone and sand. The poles should have gains cut for the cross-arms and tops roofed before setting. On light leads and on toll lines the pole is often fully equipped with cross-arms, etc., but in the city this is not necessary. All gains, roofs, etc., should be painted with two coats of pure white lead. The tops of all poles should be roofed at an angle of 45° (Fig. 4) and gains cut twenty-four inches apart, the depth being one half inch and the width four and one-fourth inches. They must be square and true with the axis of the pole and other gains on same pole. The first gain is usually eight inches from top of poles.

Quality of Poles.—All poles should be of best selected, straight, live growth timber, with butt and top squared;

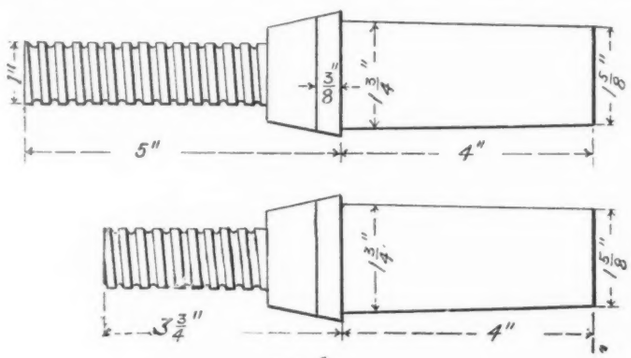


FIG. 6.

free from splinters, bark, stumpage, dry or wet rot, all knots closely trimmed.

Guy Stubs.—The material used for these should be equal to that in use on the pole line as to quality and in some cases as to appearance, the guy stubs should be not less than twenty-four inches in circumference at the top. All anchor logs should be at least twenty-two inches in circumference and six feet in length.

Cross-arms.—Ten pin cross-arms are standard for the average lead and it is seldom found economical to use less. These cross-arms are sawed from close grained heart wood of selected yellow-leaf pine, thoroughly seasoned, kiln-dried, and free from sap-wood and knots, and measure four and one-half inches by three and one-fourth inches and are ten feet long, as seen in Fig. 5. The top of the cross-arm should be chamfered to a radius of forty degrees leaving a ten-inch space uncut in center so as to fit snugly into the gain. The pin space is divided up as shown in Fig. 5. The cross-arm should be bored for one carriage bolt, two lag screws and two brace bolts. All braces should be thoroughly galvanized and be subject to an acid test, these are usually twenty to twenty-eight inches long, one and one-fourth inches wide and three-sixteenths inches thick with a hole in each end.

Pins.—Pins are made from two woods, locust and eucalyptus; the latter is coming into strong favor and presents a much neater appearance than the locust; they should be of the best quality and free from knots and soft wood. The size and dimensions are shown in Fig. 6, being used in two sizes, for straight line work and for transpositions. The pins are held in place by wire nails driven through the cross-arm at the base of the pin. The completed cross-arm should be given two coats of black metallic paint, the paint usually used is a mixture of carbon gas black, boiled linseed and B. & T. drier.

Insulators.—These are generally of glass, but porcelain knobs are often used to advantage where there is no drip toward the wire. The glass insulators are of two kinds—

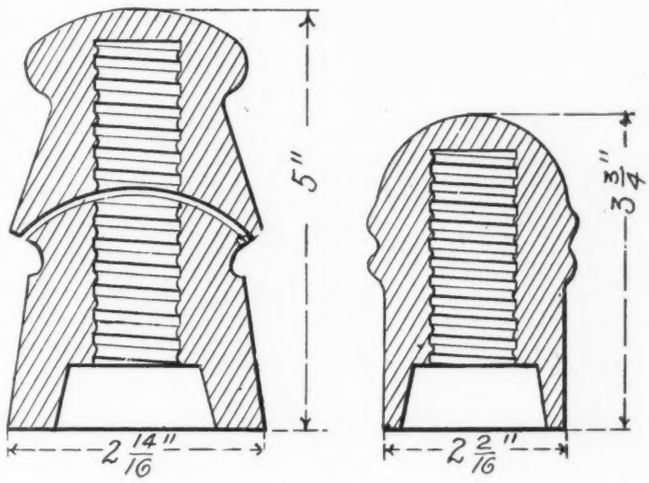


FIG. 7.

for straight lines and for transpositions, as shown in Fig. 7; sometimes the double-grooved insulator is used for transpositions and simplified construction and is much cheaper. The insulator should be free from cracks, points and other defects.

Protection of Poles.—Considerable damage is done to poles by horses and by vehicles colliding with the poles. To avoid this as far as possible, protectors are used in the shape of strips of galvanized iron fixed and nailed one and one-half inches apart. Sometimes a number ten galvanized wire is wrapped around the base for a height of five feet.

TELEPHONY IN TOKIO.

It will be recalled that it was in 1890 that the first central telephone exchange in Tokio was opened to service. At that time the number of subscribers was 150; in 1895 it had already passed 1.700, and at present it is 10,000. The last number represents the maximum capacity of the present installation, and no new subscribers can be accommodated. To-day, in order to obtain connection with the city exchange it is necessary to purchase the rights of an established subscriber, and that at excessive prices, sometimes ranging as high as 500 yen.—*L'Electricien*, Paris.

THE INDEPENDENT TOLL-LINE MOVEMENT.*

BY DR. G. W. GREAVES.

The most important industry before the public at this time of trusts and monopolies is the Independent telephone movement with its motto that every locality is entitled by every conceivable right to have not only its own local exchange, but its own toll lines and do its own telephoning. It has become a movement of the people, for the people, and by the people. It is a common uprising of the people against the oppressive monopoly which they have suffered the last twenty years from the Bell Telephone Company and its allies. The telephone industry is only in its infancy. Views that were considered visionary and optimistic yesterday are being more than realized to-day.

Thus far in operating our local exchanges it has made but little difference to my neighbor whether my work was a success or a failure. But as soon as we were connected by a common toll line, then our interest became common; his success is my success and his failure my failure. Our enemy has been closely watching this, studying our weak points, and has not failed to find them in locating our important links, getting possession of them and thus severing the chain that binds us together. The important question for us to settle in our toll line work, is how to best strengthen our weak places from the further attacks of the enemy. Let us pause to ask what is the source of strength of the Bell Telephone Company and its allies?

The only element of strength they have left and the only reason they compel the public to tolerate them in any sense is because of their extensive, compact organization, reaching with their lines into every locality with no possibility of a break. With this grip on the public they attempt even yet to coerce and compel exchanges to connect with them and no other.

Let us not forget that we are no longer in Egypt making bricks without straw, but in the promised land where we can have quail and manna to our fill if we will only rise in the morning and gather them and see that the Philistines do not come into our camp and take possession while we are sleeping.

What is our protection? More compact organization. How shall we attain this without losing our identity and individual support? is the important question for us to settle.

After the formation of a large number of plans, all of which have too many objectionable points to be practical, I have prepared the following to submit to your consideration and careful criticism: Let there be organized an extensive toll line company, sufficiently capitalized to cover all the territory desired. Let this company buy the lines of each local company or exchange for the cash value of the construction, giving stock in the parent company in payment for the same, and in place of dividends on the stock the local companies to take all the receipts of the office or the pro rata receipts with all other rights and privileges which they would have if the lines were their private property, with the exception that they cannot sell the lines outright, but may dispose of the stock if they choose.

The directors in the parent company shall have power to see that all toll lines are brought up to a common standard of construction and to see that each local company keeps its lines in proper repair or to have it done and charged to the stock of the local company. They would also have power to construct lines, buy and sell, and do all other work that would be expected of such an organization.

The special advantages of such an organization would be to bring all toll lines up to a common standard of construction and efficiency, giving special encouragement to new territory to build in and join the company, and last and most important, the forming of a compact organization in which the connecting links could not be broken. With this plan the local companies would lose the advantage of private ownership and accept those conditions which would make it impossible for any company to do violence to the success of the Independent connection. Until some such a plan as this can be agreed upon we shall always be at the mercy of competing lines.

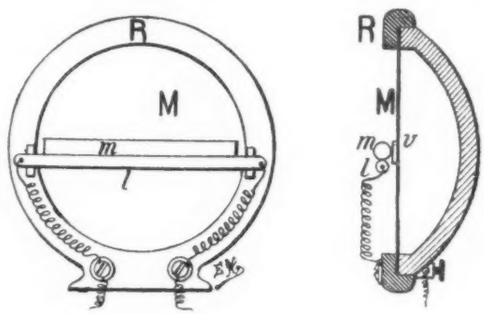
*Paper read before the Northwest Iowa Independent Telephone Association at Algona, April 15, 1903.

LONG-DISTANCE TELEPHONY IN EUROPE.

Telephonic communication has just been established between St. Martin's le Grand and Nice, a distance of 960 miles. Conversation will soon be possible between London and Brussels and between Paris and Rome.

THE MERRITT GALLY TELEPHONE TRANSMITTER.*

This apparatus differs greatly in construction from previous microphones. It has but one electrode, in the usual sense of that term. The closing of the circuit is not obtained, as in case of ordinary transmitters, by electrodes between which is lodged a mass of carbon granules of variable resistance. The microphonic circuit closes by means of a stationary piece forming part of a conductor *l* of great resistance. This is, say, of carbon, and is fixed to the framework R of the membrane M, but without making contact therewith. Upon this high-resistance conductor *l* rests a small movable piece *m* of superior conductivity, which is in electrical contact with *l* only. This body *m* constitutes for the poor conductor *l* a source from which the resistance depends upon the degree of contact existing between the two conductors. The oscillations of the membrane, caused by the sound waves, are communicated to the movable conductor by means of two projections *v* at the rear of the membranes. Simply the movement of the movable conductor upon the stationary conductor causes the variations of contact, and, in consequence, alterations in the intensity



of the current which flows through the primary winding of the induction coil.

This microphone possesses great sensitiveness. Operated by the action of a single principle, it transmits with absolute distinctness the slightest murmur, or even the feeble ticking of a watch. On the other hand, however loudly the speaker may shout into the instrument, its action continues uninterrupted and undisturbed.

This new microphone is in a certain sense a return to the principles used in constructing the first devices of the kind. It possesses but a single movable part, *m*, as did the Hughes microphone. Its action, however, is incomparably superior to the primitive type of Blake transmitters, for example. Nevertheless, it is vastly different from other transmitters from the fact that it acts by placing in short circuit, more or less perfect, an invariable resistance inserted into the principal circuit, while in the other transmitters now in use the resistance of the principal circuit is modified directly.

*From the Electrotechnischer Neuigkeits-Anzeiger. Translated for Telephony.

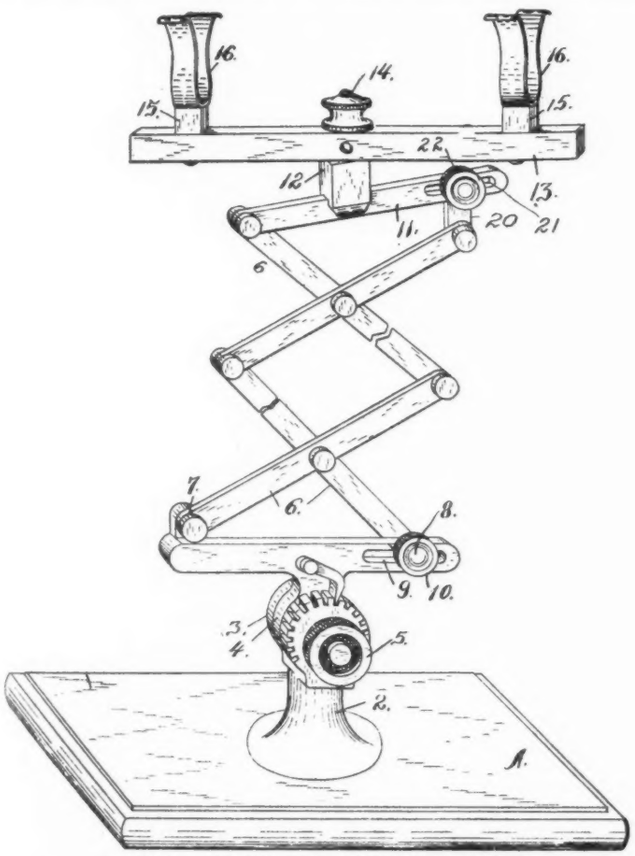
DIGEST OF TELEPHONE AND KINDRED PATENTS

Full information concerning any patent or invention discussed in this department will be furnished without charge by addressing, Edward E. Clement McGill Building Washington, D.C.

APRIL 21.

725,850—G. Königstein, Telephone Receiver Holder.

This is an extensible holder for receivers, which can be attached either to the wall, for use with a wall telephone, or to the desk for use with a desk set. On the base A a post 2 carries a pivoted base bar, on which is adjustably mounted the carrier proper, consisting of the lazy tongs 6-6, carrying the bar 13 at the upper end, pivoted on post 12 and held in position by lock nut 14. On the bar are secured the cradle spring 16-16, in which the receiver is to be placed. The bar 13 can be turned over on its side when the device is to be attached to the wall, a transverse hole being



725,850—TELEPHONE RECEIVER HOLDER.

then provided for the stem of post 12. The end members of the lazy tongs slide on the cross bars at top and bottom as the tongs are opened or closed, the play being limited and the parts locked when adjusted by means of slots 9 and 21 and lock nuts on bolts 10 and 22. A thumb nut 5 serves to lock the lower pivotal connection, and by loosening this the entire device can be swung about the base post 2, a pawl and ratchet being also provided if desired for maintaining the adjustment.

726,105—C. E. Scribner, Spring Jack for Telephone Switchboards.

This is a jack strip for multiple switchboards, and particularly for use with three-way plugs. The strips consist of a solid piece of hard rubber a, drilled from the front edge with the opening a', and from the rear edge with openings a2, these openings registering on one side of each pair, but leaving a shoulder on the other side as shown. Smaller holes are drilled through from the rear to take the stems of the metal contacts. Figure 1 shows a front view of the strip, Fig. 2 a horizontal section, and Fig. 3 a rear view turned upside down, that is, with the rear edge in Fig. 2 brought forward toward the observer. The contacts are shown in Fig. 4. The sleeve b, constituting the test thimble of the jack, is inserted from the front, its stem b' passing through the left-hand opening a4 to the rear. The ring contact c has its end bent around to embrace the plug, and

Fig. 1

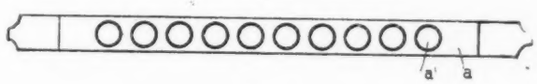


Fig. 2

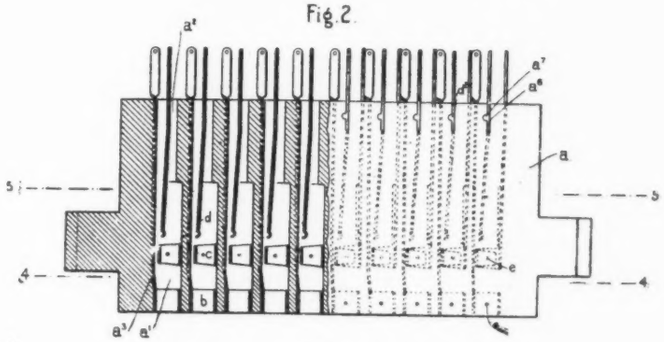


Fig. 3

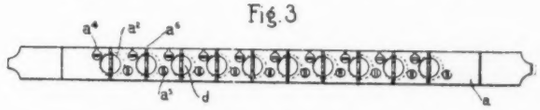
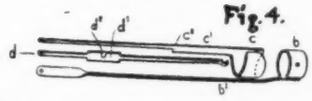


Fig. 4.



726,105—SPRING JACK FOR TELEPHONE SWITCHBOARDS.

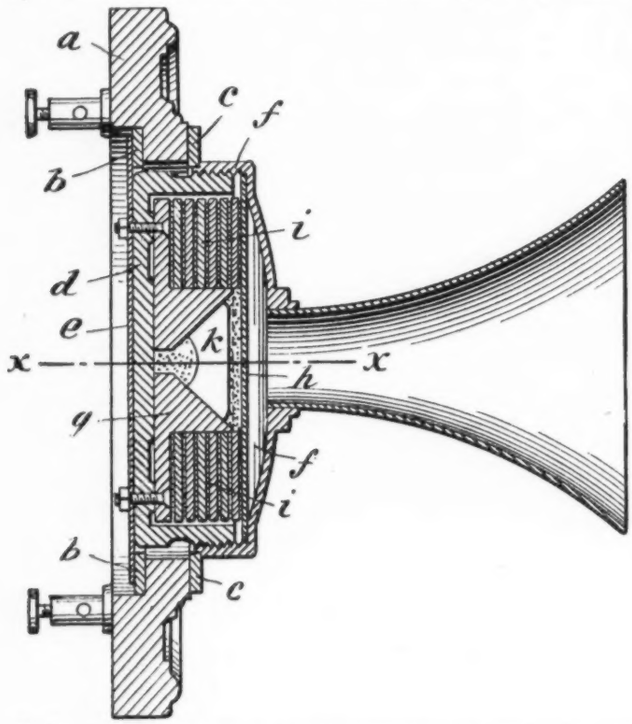
its stem c' passes back through the right-hand opening a5, having a shoulder c2 which comes against the shoulder formed in drilling to insure its longitudinal. The tip contact d goes straight back through the large drilled opening a2, and a broadened flange d' of the spring lies in a saw kerf a6, this being formed from the rear and having a small lateral opening a7 into which a projection d2 on a spring is upset when in place.

The spring c having its end bent around to embrace the plug forms a good contact therewith, and yet exerts a lateral pressure to insure a good contact also with the sleeve b. It will be noted that this strip is made without any milling or drifting of openings, drilling and sawing only being resorted to.

APRIL 28.

726,360—Microphone or Microphone Transmitter for Electrical Sound Transmission.

This is a granular transmitter which is stated to be so perfect in its operation as to delude the listener into the belief that he is not conversing with a telephone, but directly with a person. It consists essentially of a wood base *a* carrying contact rings d and c, against which are clamped the metal plate e and the metal front plate f, respectively. d is a box, presumably of insulating material, containing a rear electrode g, connected to the back plate by screws,

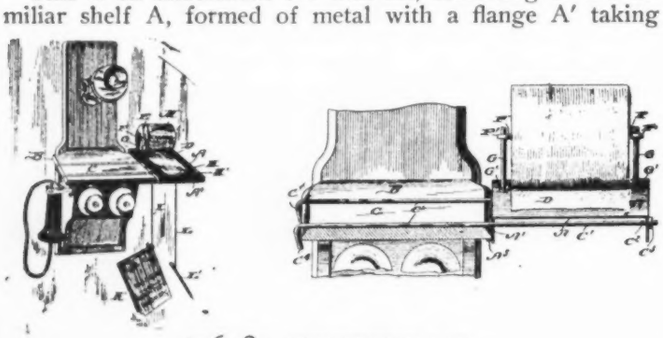


726,360—MICROPHONE OR MICROPHONE TRANSMITTER FOR ELECTRIC SOUND TRANSMISSION.

coned out in the middle and provided with a bridge k. A series of flannel rings i, poetically described as of hairy material, lie upon and around the rear electrode, and upon them lies the diaphragm h, the whole being covered in by the front plate f, which is screwed on to the box d. Granular carbon fills the coned out opening in the rear electrode, and when the diaphragm is agitated a continuous procession of the granules is supposed to start over and around the bridge k, thereby preventing what the specification calls "balling."

726,483—C. Van Riper, Telephone Pad.

This is an attachment for wall set, consisting of the familiar shelf A, formed of metal with a flange A′ taking



726,483—TELEPHONE PAD.

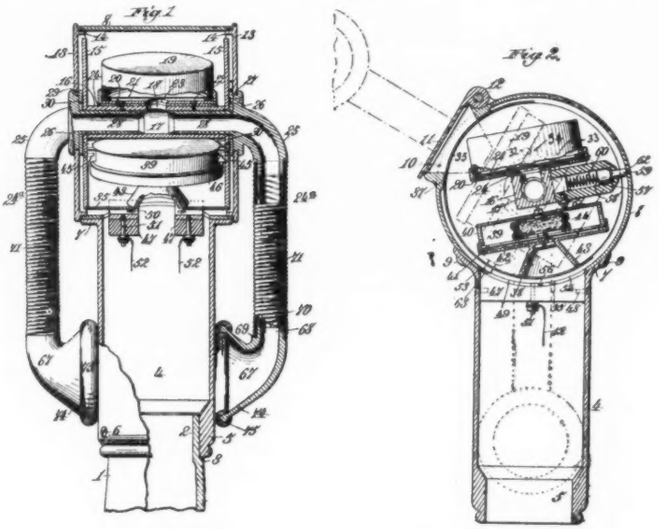
under one edge of the telephone desk, and a pair of clamping rods C′ extending across the same and having their connected end c4 hooked on to the other edge of the desk. End nuts on the rods serve to draw the same up tight.

On the desk a roll of paper is mounted between vertical posts G on which slide the eyes F′ of bolts F extending into the axis of the roll. As paper is peeled off the roll sinks down without displacement. The paper passes forward under a cutter H.

A rather clever feature in this case is the printing of advertisements on the wrong side of the paper, so that while the side that comes up on the desk is blank, the roll itself constitutes a kaleidoscopic sign-board, for which the user furnishes the motive power.

726,835—F. W. Wood, Telephonic Apparatus.

This is a telephone set designed for use on shipboard, where contingencies arise which do not present themselves on land. Thus it is necessary to guard against the corroding effect of damp salt air upon delicate parts of the receiver and transmitter; the instrument must be usable in the midst of an uproar, whether of the elements, of machinery of gun-firing, of the impact of missiles, or whatnot. To meet all



726,835—TELEPHONE APPARATUS.

contingencies, Mr. Wood (of the Newport News Shipbuilding Co., as assignor to the well-known firm of Charles Cory & Son, in New York), has designed an instrument whereof the receiving and transmitting apparatus, and in fact all the operative mechanism, is enclosed in a water and air-tight casing, so as not to be exposed to the action of the atmosphere even during use. The instrument is mounted on a stanchion or post 1, which may be upon the bridge or in the engine room or elsewhere, and is hollow to provide for the circuit wires. From this post a hollow support 4 arises, square in cross-section, that is, having flat faces on both sides. At the top of this, and formed integrally with it, is a large metal cylinder 8, having end-plates or caps 13. The caps 13 have central openings 27-29, through which pass the flanged ends of flexible ear tubes 71, each tube composed of solid metal end portions 25 and 67, and intermediate flexible portions composed of inner and outer metal coils and an intermediate rubber tube. The outer ends of these tubes are flared and surrounded by rubber rings 75, the diameter of which is sufficient to entirely enclose the ears. The inner ends 28 do not meet inside the casing, having a space 17 between them over which is the opening 18 through the cap 24 of the receiver 19, the diaphragm of which is shown at 21. This receiver is mounted on a short length of tube 16 which entirely encloses the ends 28 except for the opening 18, and which turns with the parts 28 when the ear tubes are turned up for use.

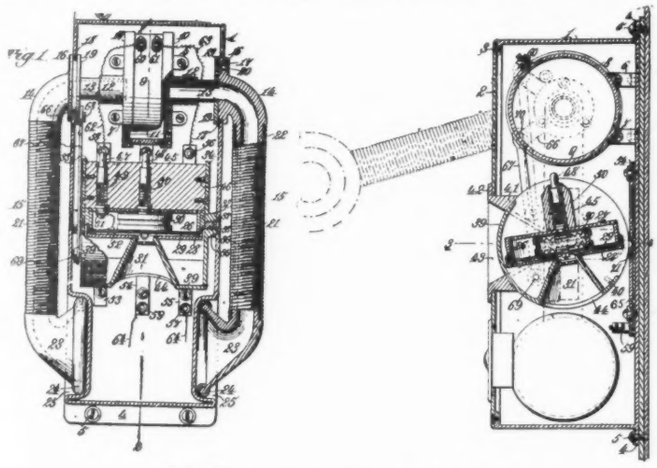
Discs 15, concentric with the end-cap 13 are fitted to turn upon the ends 28 between certain limits, a movable finger on one end piece 28 playing between stop-pins on one disc, as shown in dotted lines in Fig. 2. Around the edges of these discs is a partial cylinder 35, setting when the parts are in disuse to rotate under the opening 10 provided in the outer casing for the transmitter. This opening is closed externally by the pivoted plate 11, this double closure insuring the protection of the parts within from the outer air and moisture. Mounted between these discs 15 is the transmitter 39, its mouthpiece 43 registering with an opening in the surface 35, and opposite the receiver, so that when the latter is turned down, as shown, the granular chamber 44 is upset and the granules spilled about to insure their not packing.

Secured beneath the receiver is a block of insulation 57, carrying spring pressed plungers 59 which register normally with and take into depressions 62 in the outer casing to lock the parts in the positions shown, and which when turned around come against insulated contacts 54 and 49 to complete the circuits necessary in use, fetching up when so in use in depressions 63 in the contacts, to latch the instrument while in use.

In operation, the ear tubes 71, which normally rest in the position shown with their lower ends closed against flat faces of the box 4, are turned up and the parts are so adjusted that in order to latch plunger 59 into depressions 63 they must be turned a little farther than they will be when at the ears. After latching they are turned down again and thus the finger 34 lies between the pins 32 and 33 on the side discs, so that a little play thereof caused by swaying or movements of the head will not jar the transmitter. The receiver and transmitter are of course automatically turned around with the ear tubes, the cap plate 11 is lifted and the mouthpiece of the transmitter appears within the opening and is shown in dotted lines in Fig 2. After use, if the ear tubes through carelessness are not turned down, their weight will turn the parts until the plunger latches in its normal position.

726,836—F. W. Wood, Telephone Apparatus.

This is a companion case to that preceding, the principal difference being that whereas in the former case the outfit is mounted on a post or stanchion, in the present case it is a wall-set, adapted to be mounted on a buck head. As to



726,836—TELEPHONIC APPARATUS.

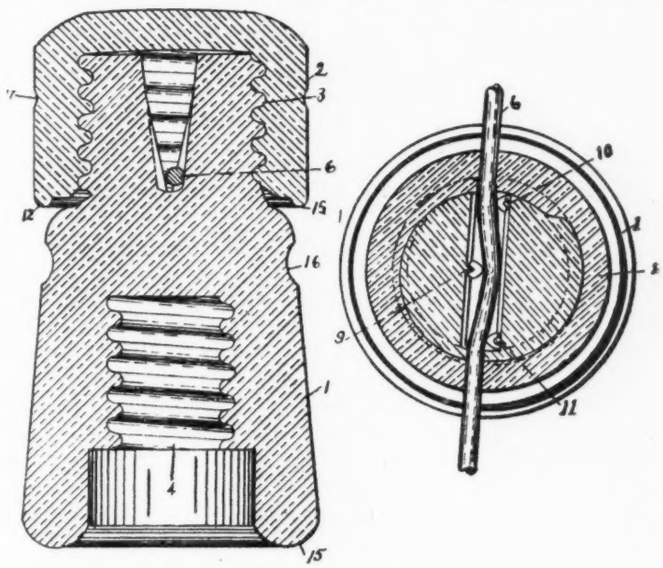
construction, the receiver is immovably mounted in this case, the transmitter alone being turned. The instrument is contained in a metal case 1 formed with a base 4, and depressions 25 in the lower part of its sides. In the upper part of the case the receiver 9 is mounted on the base, and on opposite sides or faces takes the ends of the ear tubes, 13. This receiver has two diaphragms, and magnet poles facing both ways. The transmitter is mounted on a revolvable block 45, carrying the contact as before (47-48), and having the curved cylindrical cover 39 which normally closes the outer mouthpiece 43. In order to turn the transmitter when the ear pieces are raised, a connecting rod 67 is eccentrically pivoted on an arm 67 connected to the rotating part 13, and at its lower end to the side disc 33 of the transmitter block by shoulder screw 39.

When the ear tubes are turned down their lower ends rest in the depressions 25, as clearly shown in Fig. 1.

MAY 5.

726,846—J. R. Bell, Insulator for Electric Wires.

This is a tieless insulator. The body portion 1 is screw-threaded within at 4 to screw on a wooden pin as usual, and is screw-threaded without at 3 for the reception of a cap 2. The threaded portion 3 has a groove through it provided

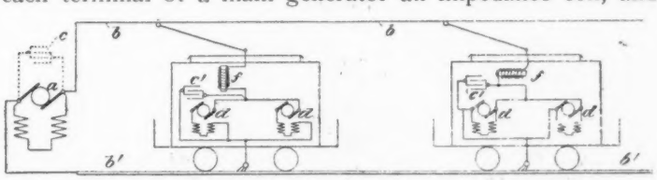


726,846—INSULATOR FOR ELECTRIC WIRES.

with upright projections or frets 9-10-11 upon its inner faces. The wire is laid in the groove between the frets, and the cap 2 screwed down upon it. If any of the parts become broken wires can be tied on as usual, the body 1 having a groove 16 for this purpose and the cap 2 having a groove 17 therefor.

726,963—Carl J. A. Michalke, assignor to the Siemens-Halske Electric Co. of Chicago, Means for Preventing the Disturbance of Telephone Circuits.

The object of this invention is the reduction of disturbing currents in electric distribution systems. It has heretofore been attempted to secure immunity from the disturbing influences of heavy commercial currents by associating with each terminal of a main generator an impedance coil, and



726,963—MEANS OF PREVENTING THE DISTURBANCES OF TELEPHONE CIRCUIT.

connecting a condenser of suitable size between the conductors at the farther extremity of the working circuit; but Mr. Michalke says experiment has shown that while such an arrangement ought to work theoretically, still when heavy currents are used the disturbance is sometimes intensified. Applied to a traction system, for example, the pulsations of

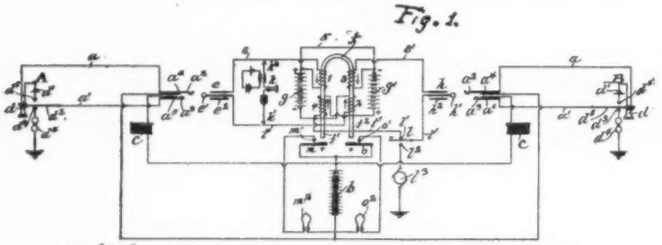
current due to the main generator and the several motors on the system are received by the condenser and tension is maintained approximately constant thereby. This maintenance of a constant tension is based upon the establishment of equalizing currents between condenser and motor or condenser and main generator. If, however, the condenser is at a considerable distance from either motor or generator its resultant e. m. f. will be impressed upon long lengths of conductor, and the currents due thereto will cause more or less disturbance. The present invention consists essentially in connecting condensers between the terminals of the motors upon the cars of a system as well as between the terminals of the main generator. Disturbances arising through unequal loading, caused for example by motors carrying widely varying loads, will cause equalizing currents in the main conductors even with the above precaution, however, and to guard against these Mr. Michalke uses condensers having a high static capacity but relatively small current capacity, that is, capable of receiving a heavy charging current, while absorbing a small amount of energy, thus preventing any large discharge to affect neighboring telephone lines.

As shown in the figure herewith, choke coils are used with the condensers, if desired.

726,964—Kempster B. Miller, Central Energy Telephone System.

This is a broad patent covering the common battery system of connections in use by the Kellogg Switchboard and Supply Company. While the arrangement of the apparatus

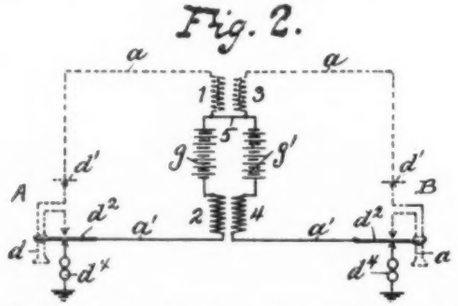
Fig. 1.



726,964—CENTRAL ENERGY TELEPHONE SYSTEM.

is ingenious, and the harmonious sequence of operations is interesting, the principal point to be noted is that two main talking batteries are employed instead of one, and that the claim of the patent apparently covers this entirely. In common battery practice it is of course the usual rule to use a single battery bridged across the cord-circuit. Apart from the question of infringement, which is an important one in this connection, the principles involved in this bridging a battery are entirely different from those involved in connecting a separate battery in each circuit in the old-fashioned way. In the present case the batteries are common, to be sure; that is, each battery serves a number of lines in parallel, but neither battery supplies two or more lines connected together for conversation, but each pair of connected

Fig. 2.



726,964—CENTRAL ENERGY SYSTEM (TELEPHONE).

lines has its own battery, and their effective union is through a repeating coil. Mr. Miller utilizes this repeating coil as a double relay to work his supervisory signals.

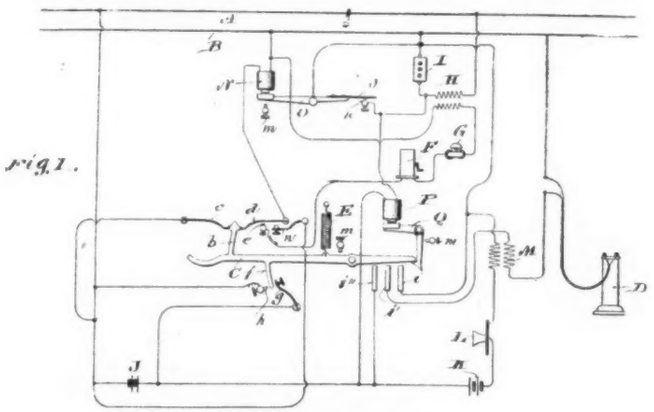
In Fig. 1 e-h are the answering calling plugs, respectively, of a pair, connected by conductors s-t- s'-t'. Between the tip and sleeve of plug e is connected the battery g, interposed between the windings 1 and 2 on opposite legs of the relay magnet f. Similarly interposed between the tip and sleeve of plug are the battery g' and the windings 3 and 4, which are opposed to the other pair of windings. Supposing both plugs to be end jacks and the lines in use, current will flow from both batteries through the respective pairs of coils 1-2 and 3-4.

These coils being opposed, the magnet poles will remain neutral. If subscriber a hangs up, current will cease to flow in coils 1 and 2, and that continuing to flow from batteries g' through coils 3 and 4 will produce a positive magnetic pole at f2 and a negative pole at f', whereby the armature m will be attracted, and armature o will remain retracted, both armatures being permanently positively polarized. Thus the supervisory lamp m2 will be lighted. If B hangs up without A, the pole f will be negative and the pole f' will be positive, and hence lamp o2 will be lighted. If both subscribers hang up, both lamps will be lighted, for the reason that the batteries and g' are connected by a tie-wire 5, and the subscriber's ringers are grounded. Both batteries will therefore send current sequentially through a circuit including ground at station A, line-wire a', tip e', cord-conductor t, coil 2, battery g, wire 5, battery g', coil 4, cord-conductor t', tip h', line-wire a', and ground at station D. Both poles f' and f2 will thereupon become negative and both armatures will be attracted to light both lamps, m2 and o2. This circuit is clearly shown in Figure 2.

When both subscribers have thus hung up, a consequent pole is formed at f, and Mr. Miller shows in one figure a third armature thereby attracted to light both lamps, as a modification.

726,984—William E. Pembleton, Telephony.

This invention has for its object to provide for secrecy in communication over party-lines, whether local or long distant, and to prevent the switchboard operators from over-

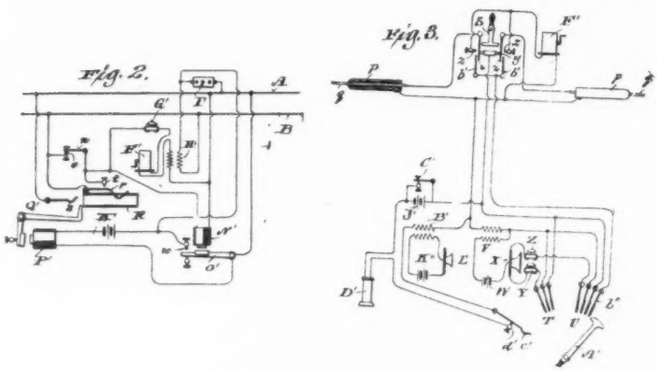


726,984—TELEPHONY.

hearing conversation through private line telephones without knowledge of those conversing. It comprises lock-out mechanism at each subscriber's station, lock-out mechanism for each line jack to prevent plugging in, both of these being actuated if there is current on the line, together with an audible signal which transmits tones over the line whenever an operator cuts in her telephone.

Fig. 1 shows the subscriber's station. Normally, the line-wires A-B are bridged by one winding of a transformer H, and a resistance I, the other winding of this transformer inducing any received ringing currents into a local circuit including the ringer G, the generator F, and a magnet N. The first impulse in this local circuit, the hook being supposed to be down and contacts d-e closed, energizing magnet N to short circuit resistance I, which is put in apparently

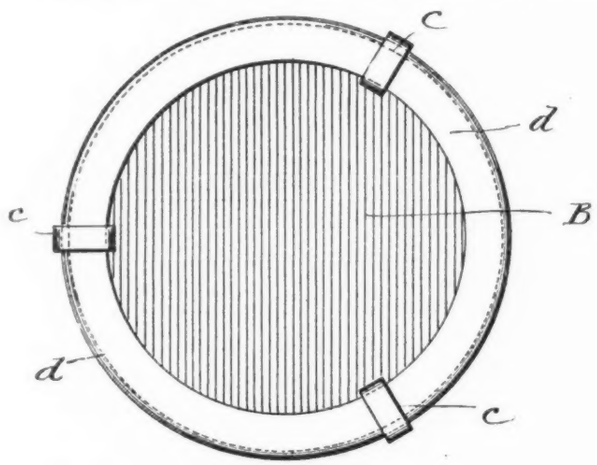
to prevent the shunting of voice currents. The operation of generator F induces currents in the line through transformer H, also short circuiting resistance I as before. When the subscriber desires to talk, he first presses the button n or takes his phone off the hook, thus bridging magnet N, and if the line is in use the battery J at some other station being bridged at such times through contact i" and i' thereat, the armature O will be attracted to cut in magnet P which forthwith attracts the armature Q which hooks under the tail of the switch-hook and prevents its closing the talking circuits. If the line is clear, the hook goes all the way up, closing the local transmitter circuit L-K and also bridging



726,984—TELEPHONY.

the receiver, the secondary of induction coil M and the battery J, the latter serving thereafter to lock-out other parties.

Fig. 2 shows the switchboard connections of the line A-B, the respective wires of which are permanently connected to jack springs r-s. If the line is in use when an operator attempts to plug in, the current thereon will have energized magnet N' when the plug is partly inserted, by reason of the closure of its circuit at contact t. The local circuit of magnet P' is then closed at w, and the armature Q rises to close the rear end of jack tube R and prevent the contact of the plug tip and its spring s. The same test may be made



727,634—TELEPHONE.

by means of a push button u, provided for each line. Generator F' and ringer G' are provided in the local of a bridged transformer H', as at the subscriber's station.

Fig. 3 shows a cord circuit, having plugs p-p. S is the ringing key, the cord conductor from the tips being broken and put onto generator one way or the other according to which way the lever is turned. D' represents the operator's telephone set, bridged across the cord by the contacts c' d', closed by lever A'. The latter cannot be turned to close these contacts without first sweeping over a double set of contacts U and T, which include two bells Y and Z placed in front of a second transmitter, so that if the lever is moved to cut in the sound of one bell or the other can be heard on the line.

As the battery J at subscriber's station, or the battery J' at central, being bridged, prevents others from coming in, means are provided to short circuit each of these batteries at will to permit such coming in after a call. In the cord this means is a key C', at the subscriber's station a key g, which cannot be used except when the hook is up.

MAY 12.

727,634—M. R. Hutchison, Telephone.

This is really a diaphragm for telephones, having the usual rubber gasket around it, and metal clamps c-c-c around the edges, bent over both sides of the gasket and extending under it on one side to rest on the diaphragm. The assertion is made that this brings a tension on the diaphragm, and electrical connection to the diaphragm is also made through the clamps.

727,701—C. B. Smith, Telephone System.

This is a rather complicated invention, not because the principles are abstruse, for on the contrary they are exceedingly simple, but because there is such a wealth of detail that to give it all would require pages. There seems to be no basic claims in the patent, although there are 79 claims made, mostly referring to matters of mechanical and electrical detail. There are 17 pages of solid description, and 7 sheets of drawing.

Two things are sought to be accomplished by Mr. Smith in his present effort, viz., the economy of line wires, and automatic selection, avoiding the necessity of operators or a switchboard. Either one of these, it is safe to say, if accomplished successfully, would constitute work for a full-grown man, and only a person with plenty of nerve would attempt both at once. The apparatus was actually built, however, a number of years ago, and operated on indoor experimental lines very nicely, as the present writer well remembers. It was installed in New York, and a great deal of money appeared to be represented by the models shown.

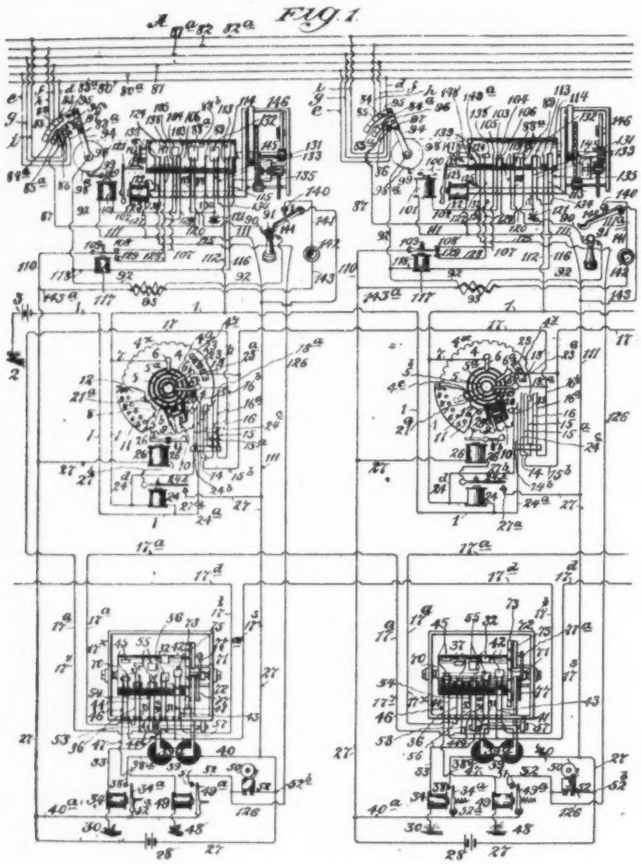
In economizing line wires, Mr. Smith uses only as many pairs as there are subscribers in the system who may desire to talk at once. That is, in a one thousand subscriber system he would provide only fifty pairs (this is his proportion, as given), and these fifty pairs are run around to all the subscribers' stations in series, like an intercommunicating cable. In addition to the line wires, there are four selector wires also run around to all the stations in series. (Just how much wire would be wasted by running all over a city with all the lines the specification does not disclose. The idea is to cut down the *number* of wires used, apparently, not their length.) Three of these selector wires are really the same wire run around three times, like a dog chasing its tail.

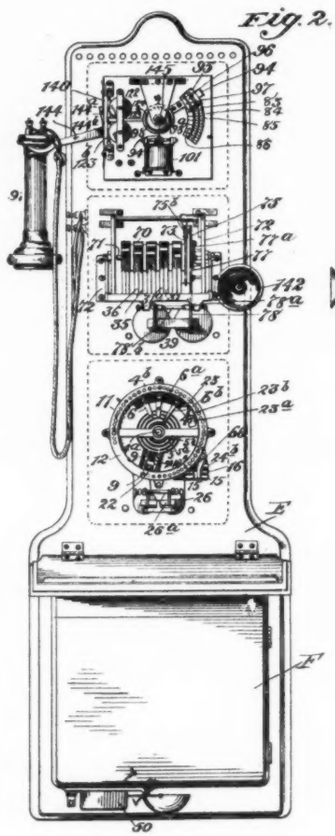
Figure 1 shows the circuits at two subscribers' stations, A and B. Figure 2 shows the apparatus mounted up. In Figure 2, commencing at the top, the apparatus has the following functions:

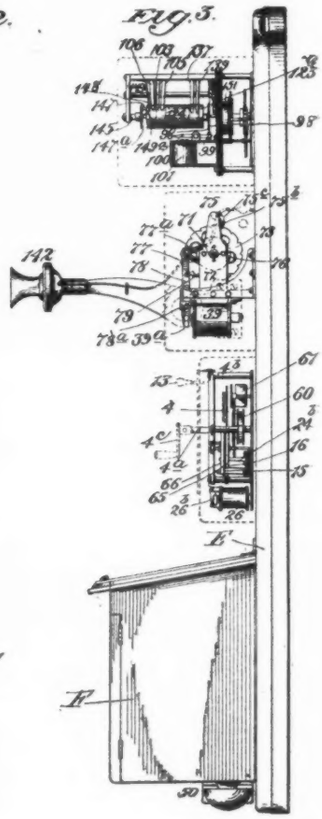
The switchhook performs as usual, in addition to moving certain parts of the selector mechanism to be referred to. The apparatus to its right is the line selector, whereby any idle pair out of the whole number provided, may be selected for use. Next below this is the call selector, which puts the calling line through from station to station step by step. Below this, at 12, is the selector transmitter, a make and break wheel having sundry complications and functions. Below this is the battery outfit, and at the bottom the bell, which is stuck away out of sight, being a purely incidental piece of apparatus, and not very showy, as it has no "wheels to go round." If it were not for its occasional usefulness

it might be dispensed with for its lack of complication and ornamental character.

Referring to Figue 1, 1 is a battery wire that runs to all the stations, and has two opposed batteries, 3 and another (shown in another figure forming a counterpart





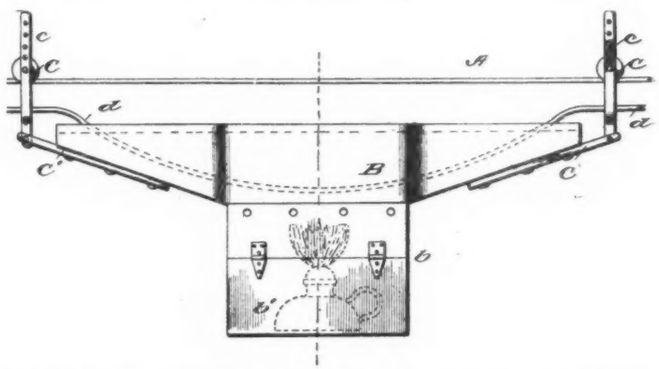


727,701—TELEPHONE SYSTEM.

continuation of this). These are grounded, as shown, and only when a ground is put on does current flow. 17d is the original calling selector wire, this being doubled back from the last station and again passing as wire 17, then back as 17a. The selection of a given station from another is as follows: The subscriber, say at station A, puts a plug in one of the holes 11 corresponding to the station wanted, and turns back the handle of his selector wheel 4, shown best in Fig. 3, until the plug stops it. This throws a switch on the wheel structure, and as the wheel is propelled in reverse movement impulses are sent over a grounded circuit. The stations on both sides, if such there be, get these, the drums 70 now starting to perform. If the call is from station A, the first impulse causes the ground to be taken off at station B and the call line put through to station C; the next impulse takes ground off at station C and puts the line through to station D, and so on. With the line thus put through to the desired station a suitable connection enables the ringing current to actuate the bell which shows such a retiring disposition in the drawing. When the receiver is taken down for use the line selector gets in its work. The arm 94 starts over the pairs of contacts 85-85a, etc., and only stops when an idle pair is found, the current on all the others serving to hold up the detents. Suitable relays and restoring magnets are distributed in suitable places, and the details of the system are worked out with much elaboration, as already stated. When the receivers are hung up all parts are restored.

727,756—J. Daggett, device for reinsulating electric and aerial telephone or other cables.

This is a means for boiling paraffine into line insulation on the line. The tank B is hung on trolley wheels C on the wire A, the wire to be insulated being shown at d-d. This wire is bent down into the tank, and a gasoline or other torch under the tank enables the paraffine therein to be



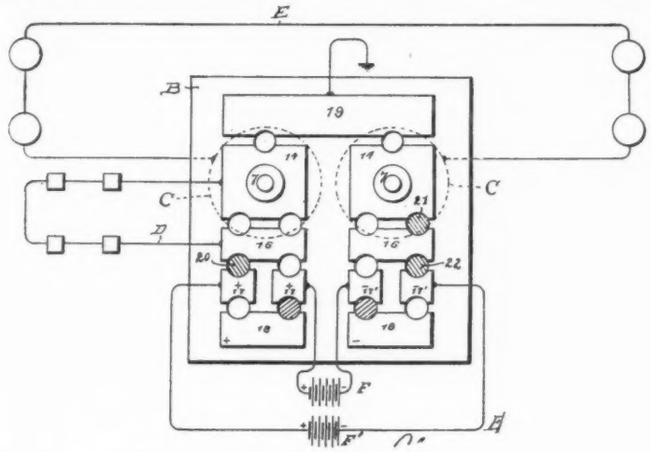
727,756—DEVICE FOR REINSULATING ELECTRIC AND AERIAL TELEPHONE OR OTHER CABLES.

boiled. Successive sections of the wire may be treated by sliding the tank along the trolley wire.

727,763—E. B. Ellicott, electrical switchboard.

The invention in this case relates to a means for conveniently connecting and disconnecting storage batteries for charging and discharging. E is the external circuit, F F' are the duplicate storage batteries, and 18-18 are the charging terminals. Plugs 20, 21, 22, etc., make the connections.

C-C are two protective devices consisting of coils and breakers, and D is an instrument circuit containing signaling or other instruments to be protected. As shown in the

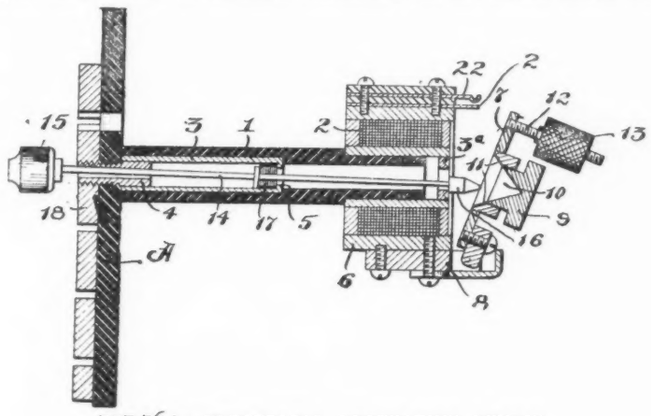


727,763—ELECTRICAL SWITCHBOARD.

figure, battery F is plugged to terminals 18 for charging, while battery F′ is connected to the circuit D and E through the protective devices C.

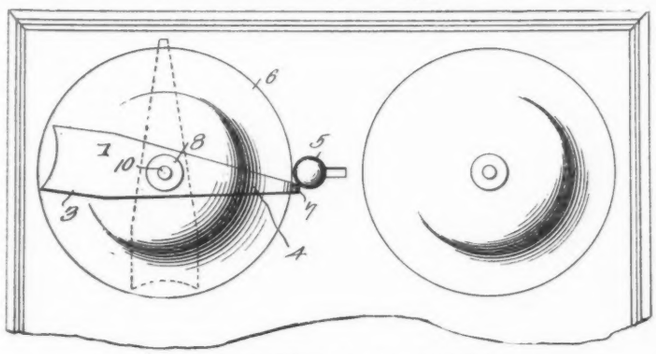
727,764—E. B. Ellicott, electrical protective device.

This is a protective device to accompany the switchboard just described. It consists essentially of the metal block 18



727,764—ELECTRICAL PROTECTIVE DEVICE.

mounted on an insulating backing A, carrying an insulating tube 1 on a metal tube 3, secured by a threaded bushing through the backing A to the block 18. On the rear end of the tube a coil 2 is mounted, having a hollow core and a



727,801—TELEPHONE CALL ANNUNCIATOR.

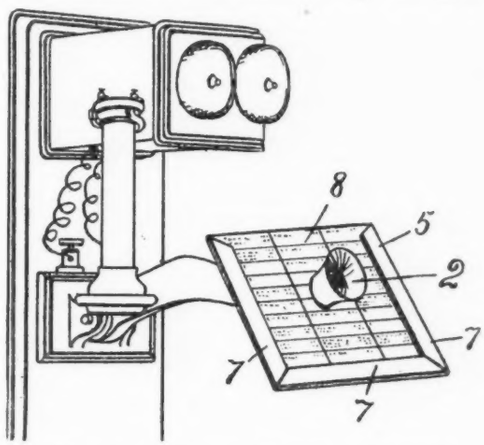
heavy tilting armature 9. Above the magnet is mounted a pair of ground contacts 21-22. In the tube is a plunger 14, normally propelled to the left by the spring 17, but held back when in use by the head 16 caught on the edge of the bushing 3a, of metal and connected to the magnet coil. The circuit is from block 18 to the plunger 14, to the head 16, to the bushing coil, and so to line. An abnormal current holds up the armature, whose inside face is coned out and lifts the head 16, releasing the plunger and breaking the circuit. The forward movement of the plunger makes a wide air gap and also serves as a signal. The contacts above are closed by the armature to ground the line.

727,801—G. K. Jackson, telephone call annunciator.

This is an arrow signal, pivoted on the gong post of the telephone ringer and normally caught by its bent end 7 under the gong striker 5. Its butt 3 is heavy and its point 4 light, so when the striker moves it will turn up into the dotted line position to indicate a deaf person or to an absentee on his return that there has been a call.

727,880—L. M. Bannon, telephone special directory.

This is a framed directory having a hole through its middle and fastened on to the transmitter by having a mouth-

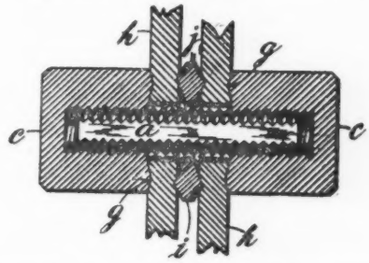


727,880—TELEPHONE SPECIAL DIRECTORY.

piece screwed on through the hole. The frame is of bent metal and may contain numbers and advertisements.

728,092—W. R. Edwards, connector for electrical batteries.

This is a connector for the lead strips of storage battery. In the figure h-h are the ends of the lead strips connected to the plates of adjacent cells or electrodes, a is connecting



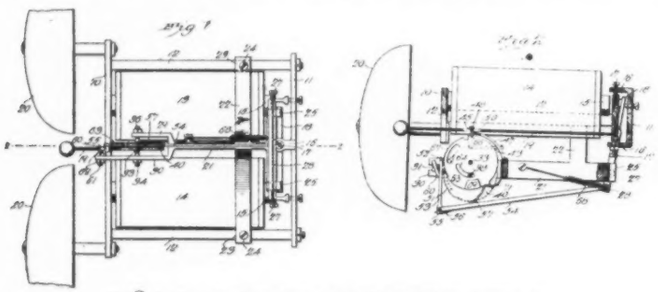
728,092—CONNECTOR FOR ELECTRICAL BATTERIES.

bolt, and c-c are nuts which screw down onto the lead strips, having ridges g which bite into the lead to make a tight joint; j is an interposed washer formed with edges which also bite into the strips to keep the acid fumes from the threads and the connections.

728,147—W. D. Watkins, telephone selecting device.

This is an improvement on a former invention of Mr. Watkins, which we have previously noted. It relates to step by step selectors for party lines, whereby a bell can be rung at any one station without ringing those at the other stations, and it consists essentially of a frame 22 to be attached to any ordinary ringer, and carrying a locking de-

vice which holds the clapper-rod of the ringer from operation until a step by step wheel has been revolved a predetermined number of steps, which is different for each station. To move this disc an extra U-shaped armature 28 is pivoted in the frame and is drawn up to the magnet poles 15 by its upper ends each time the circuit is closed, ordinary ringing current being employed. This armature carries a rod 54, which moves up and down with it, the armature being pivoted at 27 and retracted by a spring 68. The end of the rod is provided with a pivoted pawl 53, having a crosshead 52 to engage the teeth 51 in the selecting disc 40, which is pivoted at 38, and has a counterweight not shown to return it to normal position. Above the discs is an arm 47, carrying the locking device 45, which holds the clapper rod 19 from moving until a notch in disc 40 is stepped around to the point marked 66, when the locking device, which is connected to the pivoted arm 43, will drop into the notch,

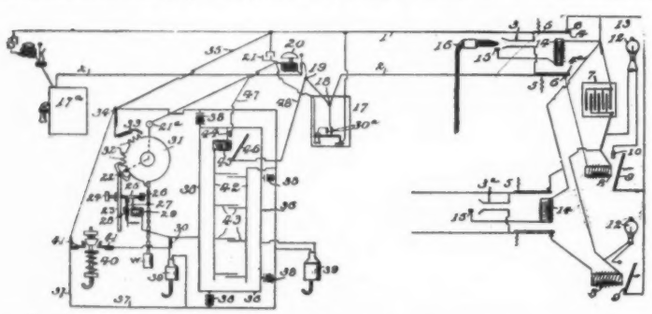


728,147—TELEPHONE SELECTIVE DEVICE.

and if the circuit is maintained closed the clapper rod will then vibrate continuously at that one station. If this were all the mechanism, stations that only required three or more impulses would be set by every signal above that. In other words, if No. 7 was called all the intermediate stations would successively be set, and all the bells would ring up to No. 7. To prevent this a guard disc 63 is pivoted at 33 above the other disc 40, a slot in each disc being provided for the passage of the arbor of the other. The disc 63 has a notch seen at its upper side, and a counterweight 69 that normally keeps the notch exactly under the locking device 45, but each time the pawl 53 is pulled down to step the disc 40 around one tooth, it gives the disc 63 a whirl, and as the impulses are short the notch does not have time to move back under the point 66 before the next step comes. Hence this guard disc 63 holds the locking device up until the disc 40 has been completely stepped around to the desired point, and then, as the circuit is held closed, it has time to come back to bring both notches in line, when the desired bell will ring, and no other.

728,161—W. L. Denio, combined telephone and fire alarm system.

This is a system of fire alarms intended to be applied to a common battery telephone system. There is considerable



728,161—COMBINED TELEPHONE AND FIRE ALARM SYSTEM.

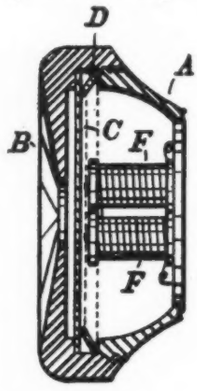
ingenuity shown in the arrangement of circuits, but the drawing is so poor that this is not apparent except by careful study. The central office is shown at the right, 1-2 being the line wires normally passing through the armatures 4 and 4a of the cut-off relay to the main battery 7 and line relay 8, controlling the armature 9 and the line lamp 12. When a plug is inserted the cut-off relay is connected to one of the jack-springs 3 and pulls in its armatures. As the circuit of the cut-off relay appears to go through its own low armature, however, this part of the device seems inoperative, but as the rest of the circuits are correct this is probably not Mr. Denio's fault, but due to the draftsman or some one else.

At the subscriber's station on the left, the ringer 20 is normally bridged through the condenser 21, and it seems to be a vibrating bell. Below at the left are seen the fire and burglar alarm circuits. A tap is taken off between the ringer and condenser to the toothed-wheel 31, thence to the anchor escapement 22, thence to the armature 25 and the magnet 29, and to the loop 36, normally disconnected from anything else, but connected in case of fire by any one of the thermostats 38 to a second loop 37, which goes back by way of wire 35 to line wire 1. If a thermostat closes, current from central passes through the ringer 20, through the wheel 31, magnet 29, etc., energizing the latter and releasing the wheel 31, which is rotated by clockwork to make and break the circuit by its teeth 32 rubbing against spring 33. This will set the line lamp, giving flashes, and these flashes will be broken into shorter flashes by the vibrations of the ringer 20.

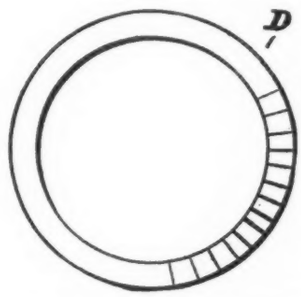
42 is a burglar alarm circuit having circuit closers 43 in circuit with a magnet 45, and as the burglar alarm short-circuits the ringer it will send the same number as the fire alarm, but without the shorter flashes. Street boxes 39 are shown for signaling in also and a circuit closer 40 for testing.

728,162—W. L. Denio, telephone.

The invention in this case consists of a corrugated washer D, placed under the diaphragm in a receiver and made of some elastic material, which may be iron, aluminum, etc. The inventor says that he observes the diaphragm operates



728,162—TELEPHONE.



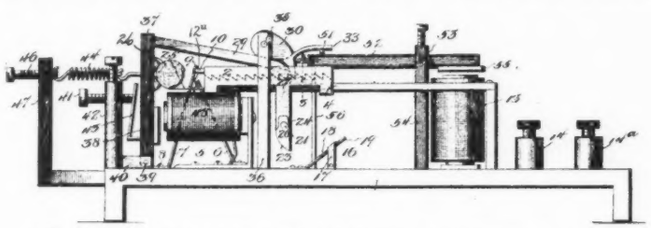
728,162—TELEPHONE TOP.

better when it is uniformly supported at a number of points around its periphery, but the principal advantage seems to be that the elasticity of the washer permits the diaphragm to be adjusted by simply screwing up or down the cap.

728,165—Fred E. Green, signaling apparatus for telephone lines.

This is another step-by-step selecting device for party lines, whereby the ringer at any particular station may be operated to the exclusion of others. The apparatus is mounted on base 1 and includes a working magnet 48, a tripping magnet 13, a circuit closer 6-7 in series with a ringer, and a circuit closer 17-18 in shunt of the tripping magnet and ringer. The description in this patent is so poor as to prevent a clear understanding of the operation, which, inferred from the drawing, is as follows: Line im-

pulses energize magnet 48 to pull up the armature 37 and so work the pawl 29 to step forward the ratchet slide 2. A retaining pawl 30 pervents the retracting spring 25 from returning the slide until the end of a signal. At its first movement the slide releases the spring 7, which would instantly close upon spring 6 were it not for an interposed rubber ball 12a, which has to have the air pressed out of it,



728,165—SIGNALING APPARATUS FOR TELEPHONE LINES.

thus serving as a retarding device. After the required number of steps the slide engages the spring 19 by its dog 20, and thereby opens the shunt, whereupon, according to the specification, the release magnet 13 works and the slide is restored to its initial position. The specification of this case is so poor as to make it a question whether the device is operative.

RURAL TELEPHONES.

BY ARTHUR PICKFORD.

Some five or six years ago it was my privilege to address an assembly of farmers on the subject of "Home Building." The central thought of that address was that home building is the main business of life and that the farmer ought to be good to himself and live while he does live; that his home should be furnished with all the conveniences and as many of the luxuries of life as his means would afford; and that these things are best enjoyed when life is most vigorous—that is, when one is working the hardest; hence the folly of deferring the acquisition of them any longer than is necessary or until one has "made his pile." I remember saying that I hoped to live to see the time when the government would deliver the mail to the farmer as well as to the resident of the city. I did not expect to see this realized inside of twenty-five years, but here it is, and it has been pushed onto us, so to speak, for the farmers as a class, have been a little shy of the idea that their Uncle Samuel would actually bring their mail to their door and not send in his bill with interest at 6 per cent.

My ideal farm house had in it books, music, pictures, some method of evenly heating it, hot and cold water always on tap, a bath room and all the things which lighten the labor of housekeeping; but the telephone never entered my mind; that was too far away. It was only to be had by those of means who lived in cities of some size. But this "strenuous life" has brought the telephone even to the isolated farmer and compelled him to add this also to the list of household necessities. He may grudgingly buy it as a luxury, but after he has acquired the telephone habit it is as much a necessity as the house clock.

It would seem as if in this swift age there would be no need of argument to convince a farmer of the value to him of a telephone connection with his neighbors and his home town; but experience shows that persons wake up very unevenly to the realization of a good thing—some of them wake up too late to catch on.

It is a rare thing to see a farmer without a windmill. A man cannot afford to waste his time and strength doing what a $75 machine will do. Exactly the same argument applies to the telephone and it costs about half as much. Any argument in favor of telephones for towns folk is a much stronger argument for their use by country people as they are more widely separated by distance than the residents of the city. No farmer who has bought an organ or a piano for the use of one or two members of his family can consistently object to buying a telephone for the use of every member at a fraction of the cost of either of these instruments.

The isolation of farm life has been one of the great drawbacks to life in the country. The telephone helps to solve that problem more than any other thing. It enlarges the social circle, binds the community together and practically enables one to fly around his neighborhood with the speed of thought.

But, since there are some who measure everything by the dollar mark, all the social use of the telephone may be thrown aside and it is a simple fact that one will pay for itself over and over again as a money saver and a money maker if confined strictly to the business end of farming.

The doctor, the markets, the buying and selling in large quantities as a community, the urgent calls for help, the needless journeys saved—these are some of the things which when one is used to doing them by telephone, make life too slow and dull without it.

TELEGRAPH TO BE SUPERSEDED.

The management of the Lackawanna Railroad has decided to gradually supersede the telegraph with the telephone in the dispatching of trains. This is not the result of a sudden change, but is the outgrowth of a steady expansion of the telephone system which now extends over the entire line. The Lackawanna was one of the first railroads to experiment with the telephone and to adopt it for general railroad work.

At present the company has ten private branch exchanges and about 600 miles of metallic circuit telephone lines, with 700 stations. For several years the telephones have been used by several of the departments, superseding the telegraph altogether. All yards, roundhouses and shops are placed in communication with each other, and 50 per cent of all messages are handled by telephone, reducing by this amount the messages sent over the telegraph wires. One strong argument in favor of the telephone is found in the fact that pay stations, where they have been established, have returned 5 per cent on the investment required in the installation of the telephone system. Experiments in this line were made shortly after the system was extended to Elmira at an expense of over $60,000.

THE AMBERG TELEPHONE.

Certain German daily papers are publishing accounts of a new telephonic apparatus which its inventor, M. Amberg, has recently exhibited to a few persons. This apparatus, of which the constructional details are not to be divulged until after the patent shall be obtained, is said to be nothing less than wonderful. Moreover, to credit the account mentioned, its cost, even in the largest size, is only a few francs. The smallest model measures five centimeters, with a diameter of only three millimeters, yet reproduces the voice with so much force that each sound is distinctly perceptible throughout the whole of a large room and in a neighboring room. The large model emits sounds of such strength as to be perfectly intelligible despite loud noises from the outside. And this is not all. The introduction into the circuit of a resistance of 26,000 ohms enfeebles only in an insignificant degree the intensity of the sounds reproduced by the apparatus, which latter, however, should not be supposed to lose anything from lack of resonance in the descriptions given of it—Translated for TELEPHONY from *L'Electricien*, Paris.

There are eighteen rural telephone lines entering the city of Iowa Falls.

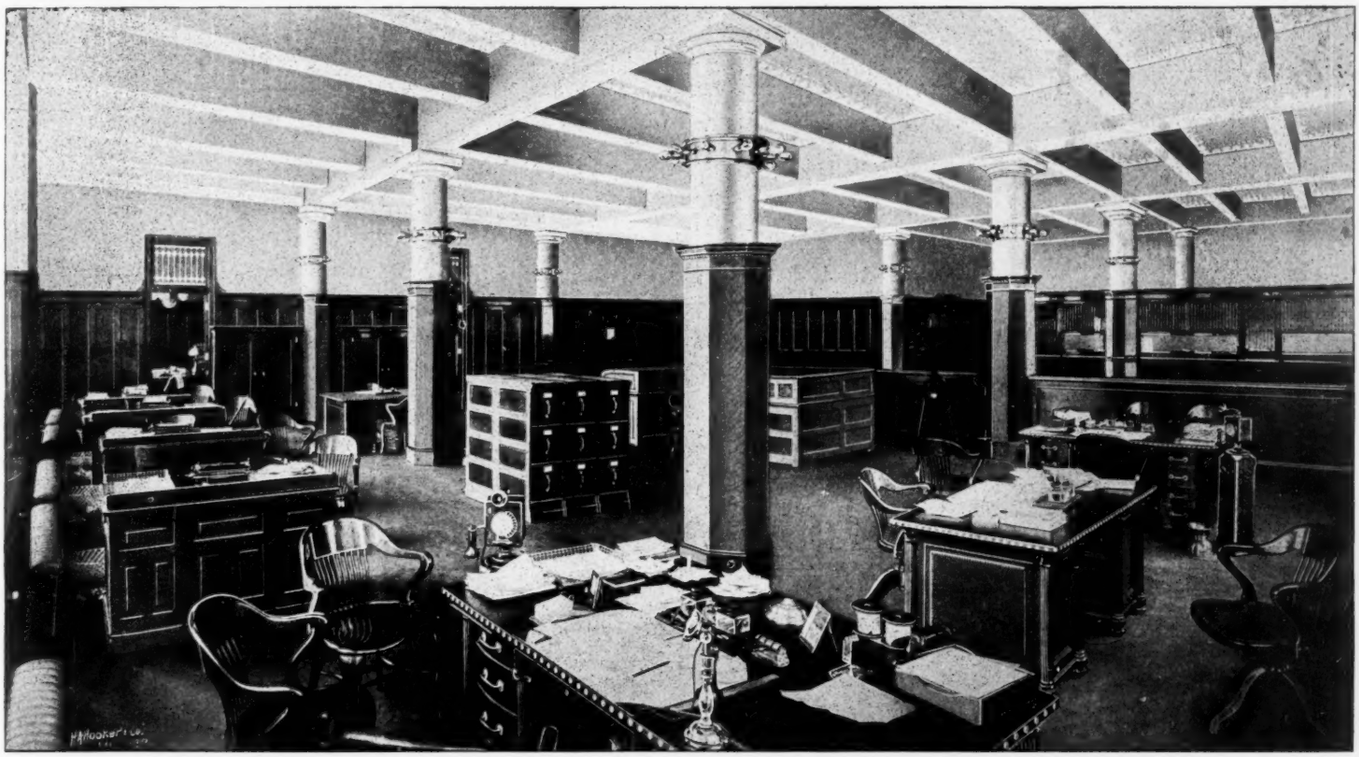
MANUFACTURERS' SECTION

AUTOMATIC ELECTRIC COMPANY FACTORY, CHICAGO.

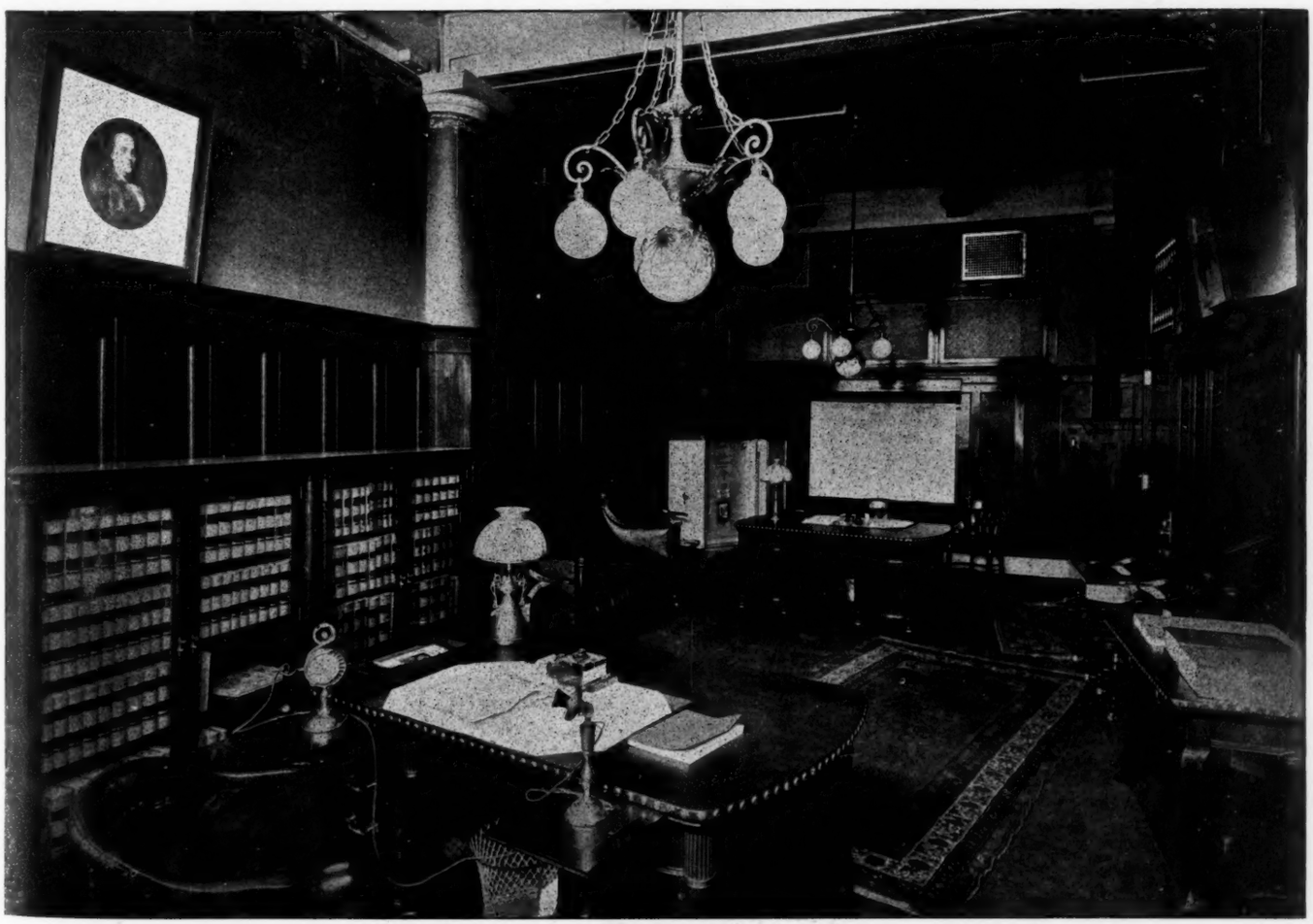
One of the largest and best equipped telephone and switchboard manufacturing establishments in Chicago (the center of the telephone industry in America) is the plant of the Automatic Electric Company, corner of Morgan and Van Buren streets. Less than one year ago this company was employing two hundred operatives; to-day eight hundred workmen and workwomen are on its payrolls. It occupies the modern six-story building which is shown in the accompanying cut, using every floor and the basement.

The equipment of this factory and the organization of its forces is characteristic of Western push and energy. Last September there was not a machine in the building and the floors and walls had not been finished. The large orders which the company received last summer for automatic telephone equipment made it necessary that this factory be put into commission at once. Hurry orders were placed for machinery of the very latest model; new men were employed, and within a few weeks the wheels were moving and every department was in full operation.

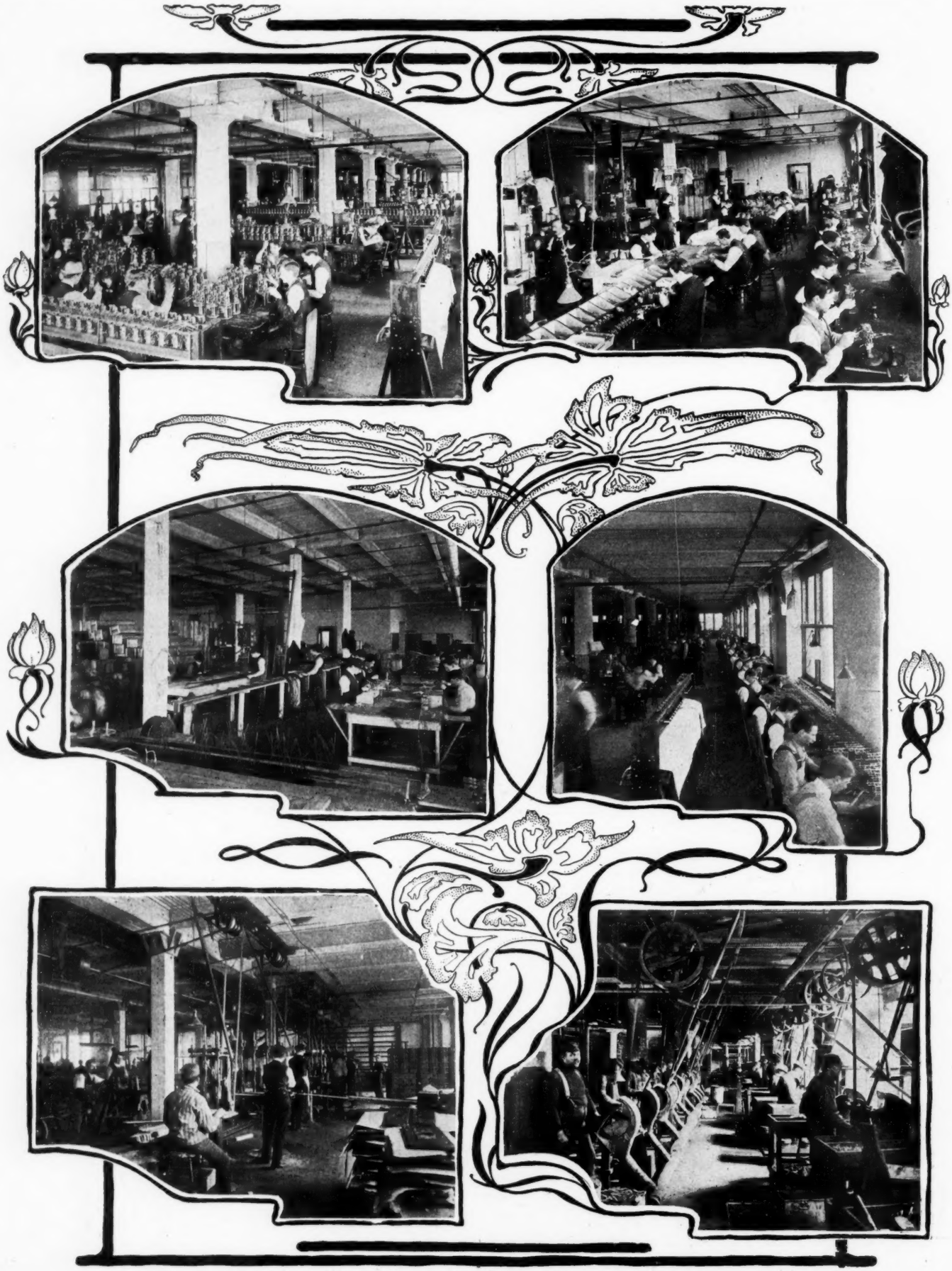
The Automatic Electric Company was organized in December, 1901, for the purpose of manufacturing and selling automatic telephone equipment. It secured the American rights to the well known Strowger patents and has met with remarkable success from the beginning. Soon after its organization the Illinois Telephone and Telegraph Company, of Chicago, placed an order for equipment for its first exchange of 10,000 stations, to be located in the downdown district of Chicago. This switchboard is almost complete and the Illinois company hopes to have it in operation in a few weeks. Provision has been made for increasing the system to 100,000 stations. Last summer the Independent companies in Dayton and Columbus, Ohio, gave the Automatic Electric Company orders for complete automatic equipment, the Dayton company requiring 6,000 stations for immediate installation and the Columbus company 7,000. The ultimate capacity of each of these exchanges will be 19,000 lines. All equipment has beeen shipped to Dayton and the work of installing will be rapidly pushed. It is believed that the exchange will be in operation within sixty days. The Citizens Telephone Company of Grand Rapids, Mich., has placed an order for 5,000 telephones and switches, the ultimate capacity to be 19,000. The Northeastern Telephone Company, Portland, Me., has



GENERAL OFFICES, AUTOMATIC ELECTRIC COMPANY.

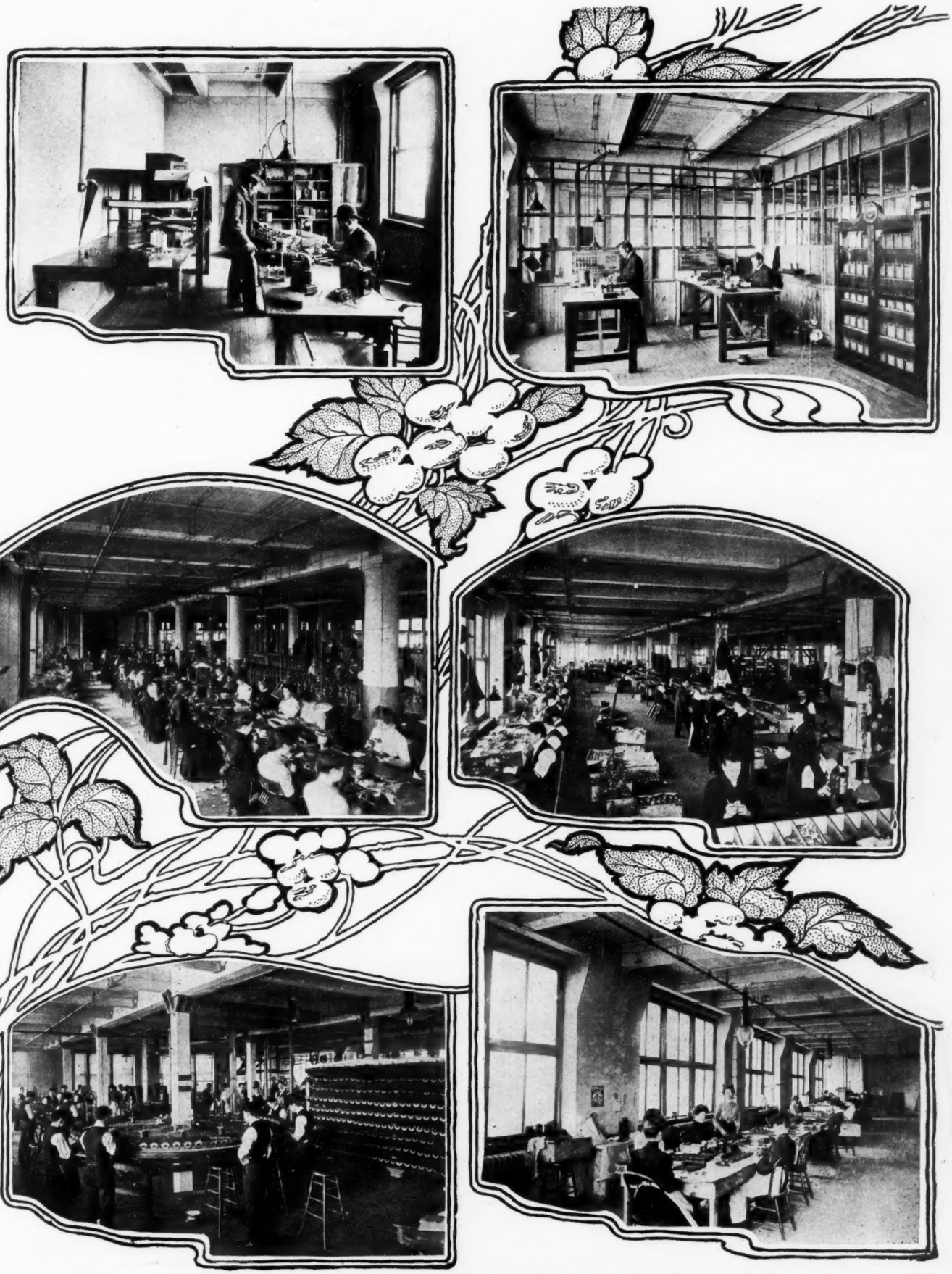


OFFICE OF GENERAL MANAGER AND GENERAL COUNSEL, AUTOMATIC ELECTRIC COMPANY.



INTERIOR VIEWS OF THE AUTOMATIC ELECTRIC COMPANY'S FACTORY.

Testing Switch Department.
Cable Department.
Switchboard Drill Department.
Keyboard Telephone Assembling Department.
Assembling Switch Department.
Polishing Department.



INTERIOR VIEWS OF THE AUTOMATIC ELECTRIC COMPANY'S FACTORY.

Testing Laboratory.
Winding Department.
"Bank" Department.
Chemical Laboratory.
Keyboard Department.
Covering and Insulating Department.

INTERIOR VIEWS OF THE AUTOMATIC ELECTRIC COMPANY'S FACTORY.

Tool Room.
Milling Machine Department.
Automatic Screw Machine Department.
Drill Press Department.
Riveting Department.
Punching Department.

ordered equipment for 2,500 stations, 10,000 capacity. These companies are constructing new buildings especially designed to house the automatic exchange. The Grand Rapids shipment is now being made, and that to Portland will follow as soon as the exchange building is ready. In addition to the large orders mentioned the company has also received orders for full equipment for the exchanges in Waterloo, Burlington and Manchester, Ia.; Mt. Olive, Ill.; Albuquerque, N. M.; Princeton, N. J.; Westerly, R. I.; Perry, N. Y.; Augusta, Ga., and a number of smaller exchanges.

As will be seen in the accompanying illustrations, the company has spared no expense in the purchase of machinery. A glance at the automatic screw machine section, the milling and drill press departments, the array of fifty-seven power presses, the large and complete winding room, the elaborate tool-making establishment and the buffing and polishing machines convinces the visitor that here is a new industry in which every preparation has been made for turning out the highest grade products. A visit to this factory and a study of the methods of handling the details of manufacturing is very interesting. From the time the crude material slides down the chutes to the basement storerooms, passing thence to the screw machines and power presses, then to the stock room from which it goes to the various assembling benches and then to the testing departments, the system is such that little time is lost and few mistakes made.

The Automatic Electric Company has a paid-up capital of $3,000,000. Its officers are: C. D. Simpson, president; J. Harris, vice president; A. G. Wheeler, Jr., secretary and treasurer; H. D. Critchfield, general counsel. Directors: C. D. Simpson, A. G. Wheeler, J. B. Russell, T. H. Watkins, C. B. Eddy, J. Harris, A. G. Wheeler, Jr.

THE WARNER ELECTRIC COMPANY.

The Warner Electric Company of Muncie, Ind., was organized February 18, 1898, to manufacture switchboard ringing generators, and after much experience found that the most economical way of securing power for signaling subscribers was by the pole changer method.

Pole changers differ from one another only in construction, as the result is the same, barring, of course, the cost of maintenance and the reliability of the apparatus. The ringing batteries of the Warner generator are only in the circuit at the actual time of calling subscribers, which makes the ringing outfit not only practical but an exceedingly cheap way of securing power for calling purposes. One cell of closed circuit battery keeps the vibrator of the Warner machine in motion, hence alternating direct current obtained from the ringing batteries. It is absolutely necessary, the Warner company claims, to keep the vibrator in motion in order to have a service that is not constantly interrupted by pole changer failing to respond.

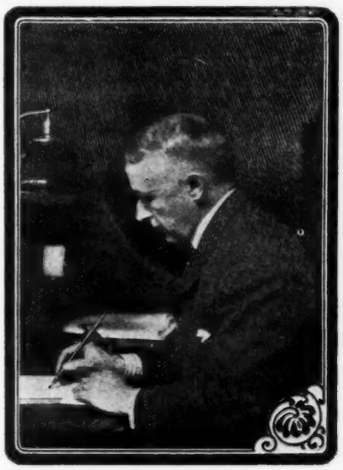
This company is also putting out a dry battery under its own label, guaranteeing same to equal any dry battery made. It also manufactures desk telephone brackets and other specialties. The Warner company claim to have sold nearly 4,000 of its pole changers and is now arranging all of its generators for selective signaling, producing positive and negative pulsating current. This arrangement interferes in no way with the alternating ringing, but adds much value to a ringing generator.

Both Mr. Warner and Mr. Johnson are interested in the Delaware and Madison Counties Telephone Company, operating Independent exchanges in Muncie, Alexandria, Anderson and Elwood.

A Canadian inventor claims to have invented a system of telephoning between stations, utilizing the railroad tracks instead of a line of wire for the transmission of messages.

GEORGE B. KERR.

George B. Kerr, Chicago agent for the Scovill Manufacturing Company, is one of the well-known men in his field.



He entered the employ of the Scovill Company as an office boy in 1868 and his rise has been marked. He was given charge of the Chicago office when the concern decided to open a western branch in 1887. Mr. Kerr has handled the western end of the Scovill business since then and under his management it has grown to very large proportions. He is a conspicuous figure in Chicago business circles and is a typical example of the self-made man. The Scovill company has a very large trade among telephone manufacturers, which has been built up entirely through Mr. Kerr's efforts. He is an affable gentleman of high attainments and his success has been deserved.

VOUGHT-BERGER VISITORS.

Among recent visitors at the plant of the Vought-Berger Company, La Crosse, Wisconsin, were G. L. Gabrielson of Mabel, Minnesota, who bought a switchboard; F. E. Davidson, president and A. C. Miller, secretary, of the Redwood County Rural Telephone Company of Redwood Falls, Minnesota, who left an order for one hundred bridging telephones and a number of series instruments and pendent telephones and an addition for their Morgan switchboard; Rev. J. C. Siegler of Nodine, Minnesota, who ordered a switchboard and fifty bridging telephones for the new farmers' lines centering at Nodine; S. G. Saxvik of Highlandville, Iowa, who ordered a switchboard; D. P. Walter of Lauana, Iowa, who gave an order for a switchboard to be installed at Postville, Iowa; A. A. Peterson, manager of the Steele County Telephone Company, who bought a toll board for Blooming Prairie, Minnesota; G. W. Morgan of Reedsburg, Wisconsin, who ordered a switchboard for La Valle, Wisconsin; Leo Pottratz of Eitzen, Minnesota, who left an order for twenty-five telephones. Mr. Brooks of the Twin City Telephone Company and the Consolidated Telephone and Telegraph Company also called.

Among other switchboard and complete equipments recently sold are: A two hundred drop board for the Grantsburg, Wisconsin, exchange of the Consolidated Telephone & Telegraph Company of Minneapolis; an addition to the Le Sueur board at Le Sueur, Minnesota; farmers' line from Decoria to Good Thunder, Minnesota, also lines in Apple Creek, Ohio, and Colorado, Texas; Windom, Minnesota; Nodine, Minnesota; Canton, Minnesota; Burr Oak, Iowa; Mabel, Minnesota.

THE IDEAL CONSTRUCTION COMPANY, Lima, Ohio, has recently secured an additional contract from the Lima Telephone and Telegraph Company, and also the contract for putting in 500 additional capacity for The Delphos Home Telephone Company at Delphos, Ohio. Those interested in good construction and modern engineering will do well to communicate with this company. It is thoroughly experienced and has a record and references not easy to surpass.

A NEW TELEPHONE RECEIVER.

The Holtzer-Cabot Electric Company of Boston, Mass., is placing upon the market its new telephone receiver, cuts of which are shown in Figs. 1 and 2. A glance will serve

FIG. 1.

to show the lines of grace and symmetry of the shell, which is made in two parts, i. e., the body of the shell and the cap.

Following the latest practice, binding posts have been discarded. The terminals are entirely enclosed inside the

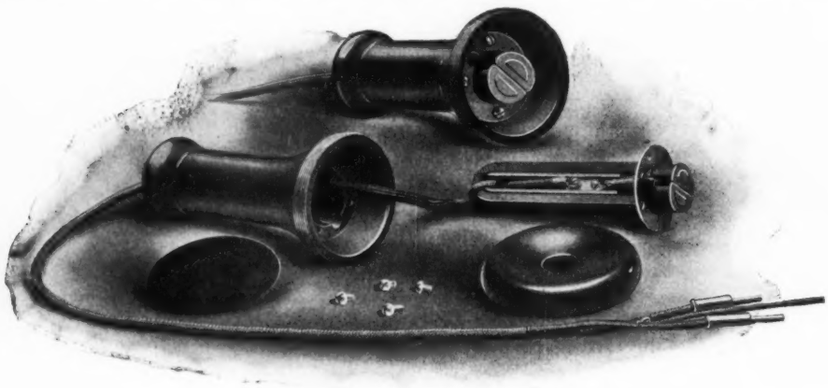


FIG. 2.

shell, making a perfect electrical connection, and doing away with the danger of the user receiving a shock, while the cord which is in all cases supplied with the receiver, is given a substantial hitch about the yoke of the magnet in such a way that no strain can come on the connections. Thus the life of the cord is greatly extended, while the work of renewing the cord is very slight.

Fig. 2 shows the internal arrangement of the parts. The permanent magnets are of a special grade of magnet steel, while the pole pieces are of the softest Norway iron. It will be observed that the construction is bi-polar. The pole pieces being semi-circular in section, give a much more efficient distribution of the magnetic lines than is possible in a receiver in which the section of the pole pieces is rectangular. This point is well brought out in Figs. 3 and 4. These diagrams were made by covering thin diaphragms with iron filings and holding them over the poles of the magnets. By gently tapping the diaphragm the iron filings were caused to arrange themselves in positions showing the direction and intensity of the magnetic lines in the region of the pole pieces. Fig. 3 shows the arrangement of the distribution in a field in which the pole pieces are semi-circular and Fig. 4 in which they are rectangular.

The adjustment feature has been omitted entirely and the receivers are permanently adjusted before leaving the factory. This is claimed to be a distinct advance in receiver

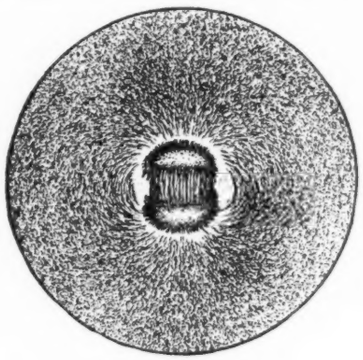


FIG. 3.

construction; only one adjustment is necessary and this should be made by the manufacturers.

The magnets are wound with silk covered magnet wire, and corrosion is prevented by nickel-plating all exposed parts.

In connection with the unusually strong magnet a heavy diaphragm is used, making an extremely sensitive instrument and one that will respond perfectly through a wide range of conditions of transmission. These instruments are carefully standardized and are made with tools, jigs, etc., so

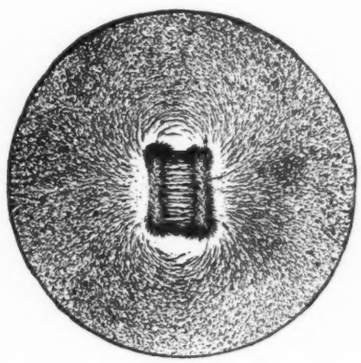
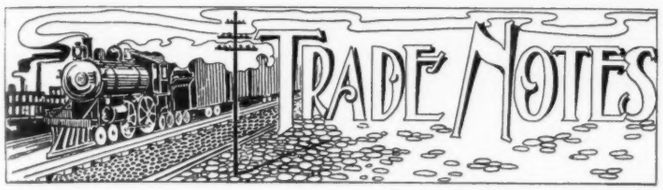


FIG. 4.

that all parts are interchangeable. The receiver may be supplied with either pure hard rubber or composition shell and the cord may be furnished with either silk or worsted covering.

THE CHICAGO FUSE WIRE & MANUFACTURING COMPANY has just issued catalogue No. 14, a copy of which is before us. This catalogue advertises fuse wire, fuse strip and fuse links for electric lighting and power circuits, also fuse blocks and fuses for telephone and telegraph work, together with wire joints and sundry items, all of the company's manufacture. The list is neatly printed on green tinted paper, with a gilt cover, and is of convenient size. It comprehends a great deal of condensed information. The company now carries stock at its three offices in Chicago, Buffalo and New York. A copy of the catalogue will be sent on request.



THE NORTH ELECTRIC COMPANY, Cleveland, Ohio, has increased its capital stock from $200,000 to $250,000.

THE WESTON ELECTRICAL INSTRUMENT COMPANY, Newark, N. J., has placed its new office at New York in charge of Caxton Brown.

E. C. MORRISON, Florence, S. C., has recently opened a supply house in connection with his electrical and telephone construction work.

THE WALKER ELECTRIC COMPANY, Philadelphia, has recently established a Western office in the Old Colony building, Chicago. F. D. Walker is in charge.

THE MODERN ELECTRIC COMPANY, Burlington, Iowa, has ready for distribution Bargain Sheet Nos. 10, 11, 12 and 15, which will be sent to interested parties upon request.

THE CRAWFORDSVILLE WIRE AND NAIL COMPANY, Monadnock building, Chicago, is installing a new plant at Crawfordsville, Ind., for galvanizing telephone wire.

WESTERN TELEPHONE MANUFACTURING COMPANY announces the removal of its Chicago office to 71-73 West Jackson boulevard, where all communications should be addressed.

THE MCROY CONDUIT COMPANY, Brazil, Ind., has moved its Chicago office to the Rookery, Adams and LaSalle streets. The office will continue to be under the management of Mr. Kirkpatrick.

THE CENTRAL ELECTRIC COMPANY, 264 to 270 Fifth avenue, Chicago, is introducing a new $1.00 bracket for a desk telephone. The construction, while novel, is said to be highly practical.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY, 118 and 120 West Jackson boulevard, Chicago, is putting on the market a new desk set that is meeting with unusual commendation.

ROSSITER, MACGOVERN & COMPANY, New York, dealers in power generators, have removed their offices to the Whitehall building, 17 Battery Place, in order to accommodate their increasing business.

THE E. E. NAUGLE TIE COMPANY, dealers in cedar poles, Chicago, has removed to rooms 705-717 National Life building 159 LaSalle street, where all present patrons, as well as new ones, will be welcome.

THE GUARANTEE TELEPHONE EQUIPMENT COMPANY, Chicago, dealers in second-hand and reconstructed telephones, switchboards and appliances, has removed to 73 and 75 West Jackson Boulevard.

THE SUMTER TELEPHONE MANUFACTURING COMPANY, Sumter, S. C., in order to keep pace with increasing demand, has been compelled to make extensions of its plant which more than double its facilities.

FRANK B. COOK, Chicago, manufacturer of telephone accessories and protective apparatus, is now able to fill orders promptly, having increased his factory some time since to more than double its former capacity.

THE C. A. MANUFACTURING COMPANY, Austin, Texas, is sending out a leaflet showing what its wood preserver will do in protecting poles from rot. Users of poles should write the company for its descriptive matter on this important subject.

BENEDICT & BURNHAM BRASS AND COPPER COMPANY, Chicago, has removed to 211-213 Lake street, where the larger quarters will enable the company to take care of its rapidly increasing business, a large share of which is with telephone buyers.

THE H. C. ROBERTS ELECTRICAL SUPPLY COMPANY, Philadelphia, Pa., has moved into larger quarters at 905 Arch street. The line of specialties handled by this company are of the highest order of merit, and its promptness in filling orders is traditional.

THE WILLIAMS-ABBOT ELECTRIC COMPANY, Cleveland, Ohio, is manufacturing a new desk set holder which is described in a folder being mailed to the trade. This folder, together with the company's new catalogue, will be mailed post-paid upon request.

THE DOUBLEDAY-HILL ELECTRIC COMPANY of Pittsburg, dealer in general electrical supplies and telephone construction material, is preparing to add to its reputation for prompt shipments, having removed to its large new eight-story building, where it is enjoying increased facilities.

THE AMERICAN ELECTRIC FUSE COMPANY, New York, Chicago and Atlanta, is just issuing a catalogue of its numerous specialties, including a new protective device for exchanges. In this device, for the heat coils at present in use is substituted a self-restoring and self-soldering heat cartridge.

THE SWEDISH-AMERICAN TELEPHONE COMPANY, Chicago, has issued a catalogue that is something more than a catalogue. It is called an "art souvenir," and fully merits that designation. Aside from its artistic excellence, however, it will well repay any amount of attention and study on the part of telephone buyers.

W. H. ANDERSON & SONS, Detroit, Mich., have issued a booklet, which will be sent upon request, describing a number of their construction tools, and especially a pole-raising wagon which is a great saver of time and expense. This wagon handles poles of any length up to seventy feet, and marks a distinct advance over the old methods.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Madison, Wis., reports a volume of business exceeding all previous records. The various new types of telephone apparatus made by this company are meeting with much success wherever placed. A large shipment of telephones was recently made to Guatemala. The new No. 132 telephone switch-hook, with platinum pointed German silver springs, is meeting with large sales.

THE NEW HAVEN NOVELTY MACHINE COMPANY, New Haven, Conn., reports that its business has grown so rapidly it has been found advisable to open an office at No. 1112 Merchants' Loan and Trust building, Chicago. The office has been placed in charge of H. J. Minhinnick, formerly engineer for the Cedar Rapids and Marion Telephone Company. The company's product is now being handled by the leading jobbers and supply houses, and a number of new

specialties are in preparation. Write the company for its new poster postal.

FRANK B. COOK, Chicago, has recently been granted patents on certain mechanical devices which he claims will revolutionize the telephone industry. He would not state the nature or scope of the devices.

W. N. MATTHEWS & BRO., St. Louis, Mo., have recently issued a very attractive catalogue entitled "Let Us Cast Your Anchor." The catalogue is profusely illustrated and relates to Stombaugh Guy Anchors. It contains a great deal of practical matter on construction and will be sent free upon request.

THE AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, has recently issued a book on "American Beauties," which is one of the best printed and most complete catalogues of the year. The book is the work of Mr. Charles F. Speed, the company's advertising manager, and will be sent upon request if the writer will kindly mention TELEPHONY.

THE WARNER ELECTRIC COMPANY, Muncie, Ind., has over four thousand of its well known pole changers in use throughout the United States. The company has lately added a new feature to its pole changers, making them available for straight, alternating ringing and selective signaling. No charge is made for the improvement, which adds greatly to the value of the machines.

THE AMERICAN ELECTRIC TELEPHONE COMAPNY, Chicago, has recently secured the contract for a switchboard and 6,000 telephones for the Fort Worth Telephone Company, Fort Worth, Texas. Among the more important installations furnished by this company are also those at Jackson, Tenn., and Paducah, Ky., which are reported to be giving the highest satisfaction.

THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, Chicago, has closed contracts with the Cuyahoga Telephone Company of Cleveland, Ohio, for a fifteen thousand line switchboard, which is a duplicate of the Kellogg equipment supplied the Frontier Telephone Company of Buffalo. The company also secured four large contracts from the Kinlock Telephone Company of St. Louis.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY of Chicago, Ill., and Rochester, N. Y., has about completed the installation of a 4,800 ultimate capacity lamp line multiple switchboard with 2,400 lines present capacity for the Interstate Telephone and Telegraph Company at Springfield, Ill. The Interstate company has nearly completed its underground system, which extends over the major part of the city.

THE CLARK AUTOMATIC SWITCHBOARD COMPANY, Providence, R. I., has issued a catalogue illustrating the construction of its apparatus. The dominant characteristic of the Clark apparatus seems to be simplicity, and consequent freedom from derangement. The company has realized, in adopting its various designs, that the only truly automatic apparatus is that which dispenses with frequent ministrations by the troubleman.

THE LINDSLEY BROTHERS COMPANY, Chicago, has recently closed one of the largest cedar pole contracts on record. The contract was closed by C. P. Lindsley, the company's vice-president, and aggregates $150,000. The poles are for Salt Lake City, Ogden and other towns in Utah. Mr. Lindsley in speaking of the order said that his company, being a producer, is one of the few concerns in the cedar field that could handle such an order.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, has just issued a bulletin entitled "The Latest Developments in Telephony," which will be sent free to telephone men upon request. The bulletin is fully illustrated and gives a description of the company's complete line of apparatus, including central energy and generator call telephones, as well as the company's large central energy lamp signal switchboards, installed during the past year. The bulletin covers small switchboards and other apparatus.

LIBBY AND COMPANY, Chicago, have recently opened up offices and will handle a complete line of telephone and electrical specialties, devoting a great deal of time to the sale of hygienic telephone appliances. The firm is composed of Frank Wyman Libby and J. E. Brada. Mr. Libby is a newcomer in the telephone field. He was for several years with the American Bicycle Company. He is a pusher and possesses all the requisites which bring success. Mr. Brada is the principal factor in the Antiseptic Telephone Appliance Company and is already well known in the telephone field.

THE PEIRCE PATENTED CONSTRUCTION SPECIALTIES.

The many objections to the use of wood brackets on brick or stone walls are conceded by everybody. It is a difficult job to put them up and requires considerable time. The chances are that they will not stay up for any length of time, or, at any rate, they are easily twisted out of shape and many troublesome cases resuit. Should an occasional one

hold on securely it cannot easily be taken down if it is desired to discontinue the service. Their appearance also is very much against them.

Almost the same objections apply to all common iron brackets; besides their extra cost must be considered also the fact that they are liable to break the insulators or will not hold the insulators securely.

This condition of things led to the invention of the Peirce

patented steel brackets and anchor bolts and the Peirce hammer drill.

The Peirce bracket embodies the only inexpensive and efficient method of attaching a glass insulator to a piece of bar steel.

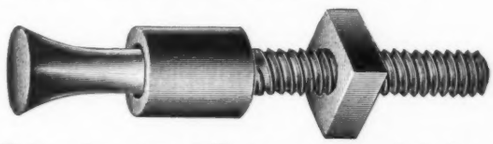
The bracket is made of ¼"x1" Bessemer steel, galvanized. The ends of the bar are slightly bent and act as wedges to spread the split pins when the same are drawn upward by screwing the insulator on.

It is claimed that they are cheaper in "first cost" than other metal brackets, and cheaper than wood brackets if cost of labor of installing them is considered. The maintenance expense is entirely eliminated. Their strength and durability are also urged as points in their favor. Insulators will not be broken by expansion of the metal, nor by screwing the same on too tightly.

The Peirce galvanized steel anchor bolts have been especially designed for fastening the Peirce bracket to brick or stone walls, but, of course, may be used for any number of purposes, such as fastening to brick walls, telephones, porcelain knobs, glass knobs, etc., etc.

Much less time is required to install them; they will stand a much heavier strain, require smaller holes and make firmer and more secure fastenings than other expansion bolts. They cannot turn in the holes and positively cannot pull out.

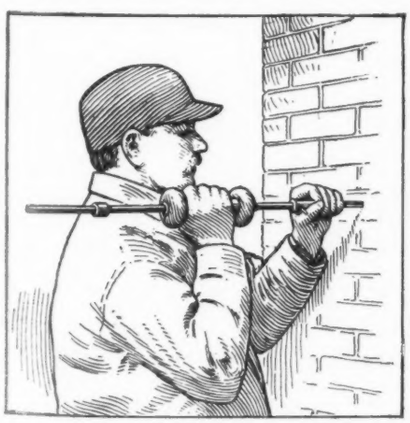
A Peirce anchor bolt can be installed in less than one minute with the aid of a Peirce hammer drill.



The Peirce hammer drill is recommended for drilling holes quickly in brick or stone walls. It is claimed that this tool has no equal, for the reason that every blow struck

with the sliding hammer counts for all it is worth, and it is worth more than a half dozen blows with an ordinary hammer and drill. Each blow must be struck squarely, and as the hammer strikes near the drill point, the full benefit of the same is obtained.

It will be noticed by the two illustrations that one end of the drill consists of a chuck and drill for boring, while



the other end is a hollow punch used for expanding the lead sleeve on the bolt. In an ordinary brick wall a hole from ¾" to 1" deep should be made with the hammer drill. The anchor bolt is then inserted head first, and by using the punch end of the hammer drill the lead sleeve is forced back over the expansive head and into every crevice of the brick or stone. About three or four blows are necessary to expand the lead sleeve, and the bolt is ready for use. This can all be accomplished in less time than it takes to tell about it.

The more strain put upon the bolt the more it tends to expand the lead sleeve and the tighter it becomes.

The hammer drill is also perfectly adapted for use with long drills for boring through walls.

Peirce underhanging brackets are used for temporarily or permanently doubling the capacity of a cross-arm. The

use of this device does not weaken the cross-arm with bolt holes. They are adjustable for any size arm; are easily put up and afford the best of insulation.

These brackets are used principally for temporary work, and the ease with which they may be put up or taken down recommends them for this purpose.

Peirce break arms are used for breaking a through wire for a series drop; for dropping from the end of a route arm or for a transposition.

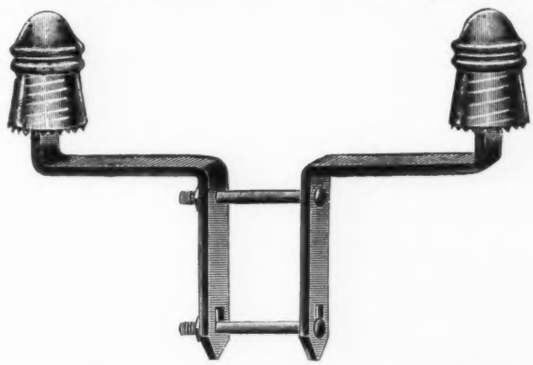
They are as easily put up as the underhang brackets, no extra tools being required. They do not weaken the arm with bolt holes and are adjustable to any size arm. When used to drop from the end of an arm they leave the end route pin available; whereas common arms use this space.

The same method of fastening the insulators is used with the break arms and underhanding brackets as with the brackets.

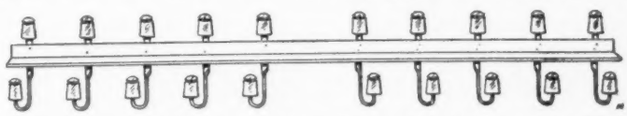
By using the Peirce patented brackets angle iron cross-arms are made up at a price that will compare favorably with common wood arms.

The following are some of the advantages claimed for angle iron cross-arms:

They will outlast wood arms; are stronger and afford more substantial construction. Their neat appearance is in



their favor. They occupy less space on the pole and greatly lessen the danger to the pole from wind and sleet storms. They do not afford a landing for ice and snow and reduce trouble cases from this cause to the minimum. Few trouble cases will occur on a line equipped with angle arms,

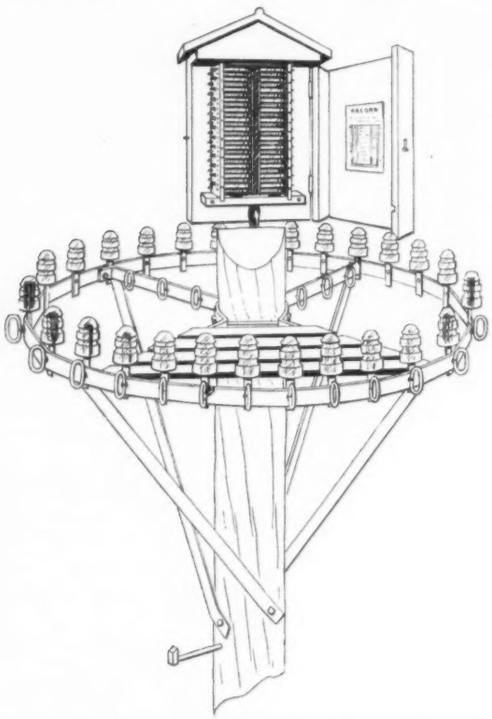


as there are no pins to break and the insulators cannot pull off; but when trouble does occur it is a positive case and is easily located.

Circle pole-top block distribution, with Peirce distributing circles and pole houses, are for exchanges in good-sized cities, especially in business sections where the buildings face all sides of the block, this kind of a system is highly recommended as efficient, substantial and most economical from a construction and maintenance standpoint.

A pole set near the center of the block is equipped with a distributing circle and pole house, and is fed with either an underground or aerial cable. From this one pole the rear of every building in the block can generally be reached with a straight drop, for which twisted pairs of rubber-covered wires are used.

This system is less expensive than a complete underground installation, and from a maintenance standpoint it

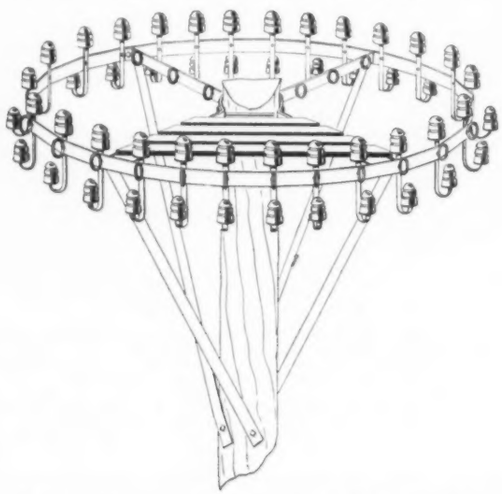


is preferable, as the iron pipe laterals and pump-log runs under sidewalks (the bugbears of an underground system) are eliminated.

The advantages of the system over an open wire aerial distribution are too manifest to require mentioning.

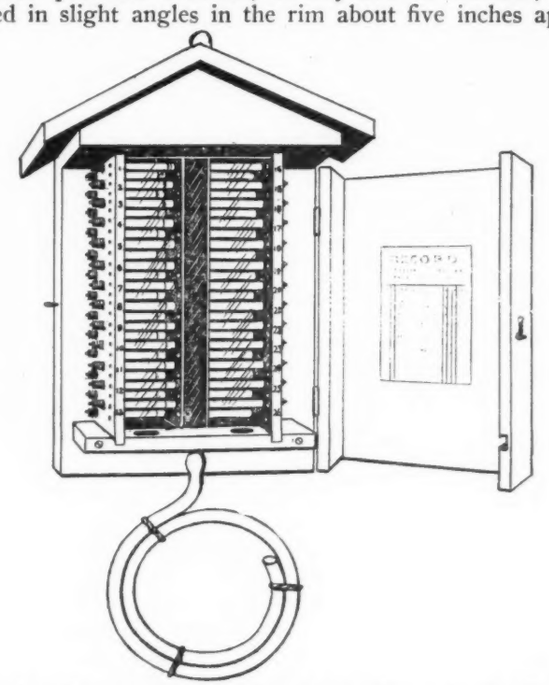
The system commends itself on account of its simplicity, as well as its neat and substantial appearance.

Peirce pole-top distributing circle is 41 inches in diameter and is made of galvanized steel 1½"x¼". Horizontal



braces of the same material are riveted to the rim and the diagonal braces are furnished for bolting to the horizontal braces at a point near their outer end. The excellent manner of bracing the rim will be noticed by referring to the cut. The manner of fastening the diagonal braces prevents any twisting and is considered an important advantage over the old way of bracing circle tops.

Peirce patented brackets, twenty-five in number, are riveted in slight angles in the rim about five inches apart.



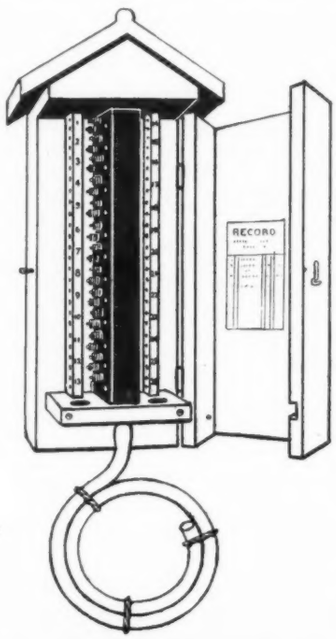
Single brackets are used in the twenty-five pair distributer, and double brackets in the fifty-pair.

The distributing circle is secured to the pole by ordinary machine or lag bolts.

Jumper wire rings are provided at the base of each pin on the outside of the rim and along two of the horizontal braces.

One quarter-section of the circle is furnished with a seat, as shown in illustration, from which every part of the circle may be reached. There is ample room between the braces and between the rim and pole to allow a man to get through the distributer.

With each distributing circle a Peirce pole house is recommended for mounting above the distributing circle, with the door opening directly above the pole top and facing the seat on the distributer so that the lineman may easily reach any part of his work without changing his position.



Description.—The pole house is made of clear cypress, painted white inside and outside. The sides and front form the door, which is hinged to the back, and when opened allows free access to all wires and connections. The terminal head is made of iron, front and back, with fiber sides.

Binding posts, to which the cable conductors are soldered on the inside, are mounted upon the outer surfaces of the fiber sides. Peirce tubular fuses pass through holes in the inner frame and are screwed onto the binding nuts and afford

firm and secure connections for the jumper wires. The fuses are held firmly in a horizontal position by the frame. This inner frame with a glass front completely incloses the terminal head, which is itself absolutely water and air tight and is filled with cable compound.

Each conductor terminal is numbered on the edge of the inner frame. The fuses are very easily taken out or replaced.

Peirce pole houses are always furnished complete with a short piece of cable attached and with all wiring done. The terminal head is filled with cable compound and is completed at the factory. The head is sealed at the top with a screw plug. The cable sheath is secured by a wiped joint to the lower end of the head.

To install a Peirce pole house it is only necessary to splice the line cable to the short piece of cable furnished with the house. The jumper wires are to be brought down through the sides of the box to the jumper wire rings on the cross braces of the distributing circle, and then distributed to the insulators through the rings around the circle.

The following advantages are claimed for these pole houses and terminal heads:

They are very small and light and very easily installed. The wiring and filling is done and it is only necessary to splice the line cable to the end of the short piece of cable with the pole house. They are great time savers, to distribute from, to test from, as well as to install. They afford the best protection. Furnished fused or not fused. Fused terminal heads are recommended where distribution is made to aerial lines, but are not considered necessary when only short rubber-covered drop wires are used.

The house described above is for use with paper cable only, although it is not necessarily used with a distributing circle. It is perfectly adapted for use as an ordinary terminal head for distributing on the side of a pole to crossarms.

The Illinois Electric Company, Chicago, are general sales agents and will be glad to furnish more complete information, prices, etc., upon request.

FRANK L. MIDDLETON.

One of the important recent changes in manufacturing circles is the resignation of Frank L. Middleton, who for the past three years has been prominently identified with the sales and correspondence departments of the Stromberg-Carlson Telephone Manufacturing Co., to accept a similar position as manager of sales department with the International Telephone Manufacturing Company.

While comparatively a young man, Mr. Middleton has had a broad practical experience in the telephone field from the standpoint of operating as well as manufacturing.

Twenty years ago, although a mere schoolboy, he was employed as night operator and later as inspector by the Central Union (Bell) company at Elkhart, Ind. By a series of rapid promotions he was soon appointed manager of that exchange and had the distinction of being perhaps the youngest manager in the employ of that company, with whom he remained for a period of about eight years.

For some time previous to the inception of the Independent telephone movement he was engaged in various other pursuits, but at the opening of Independent activity he again took up this line of work in the organization of the Elkhart Telephone Company, one of the first Independent exchanges in the country.

He later assumed the management of the Merchant's Mutual Telephone Company of Michigan City, Ind., which position he resigned to assist in the organization and take charge of the construction of the Independent exchange at Waco, Texas, which is considered one of the largest and best constructed exchanges in the Southwest.

At the completion of this plant Mr. Middleton resigned the management of this company to enter the manufacturing field in the offices of the company from which he has just resigned.

His wide practical experience and knowledge of telephone work in all its branches, his business tact, his fair and square dealings, together with his geniality, have won for him a wide acquaintance and many strong friends among the Independents.

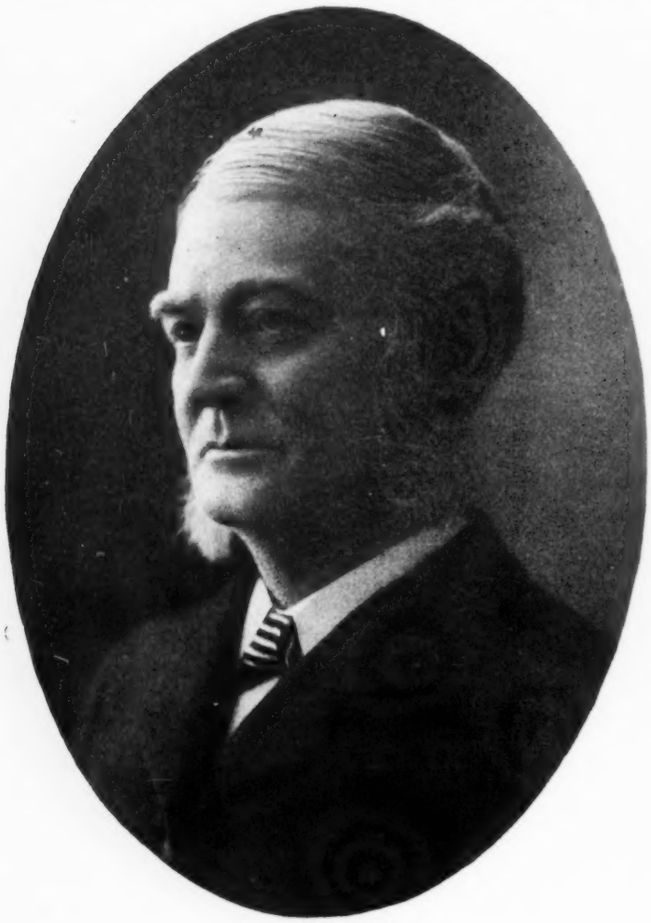
DAVID CANMANN.

David Canmann, the subject of this sketch, is vice-president of the Eureka Electric Company, Chicago, and one of the city's progressive young business men. He was born in St. Louis thirty-one years ago, where his education was completed. After leaving college he took a three years' course in electrical engineering. In 1900 he became associated with the Eureka company. Mr. Canmann is said to be one of the best basso soloists in the west, having appeared with Theodore Thomas' orchestra and other noted musical organizations. He is a man of engaging personality and has made many friends in the telephone field. He will have charge of the Chicago office of the Eureka company, which has recently moved its factory to Genoa, Ill., the company keeping a Chicago office for displaying its line of apparatus in the telephone center. Mr. Canmann in his handling of the Chicago office will give it the same careful attention which has been a material factor in building up the Eureka business. It might be said in passing that the Independent telephone manufacturing business is in the majority of cases managed by young men. The movement being comparatively new, has appealed to the younger men, who are on the outlook for a business opening. Mr. Canmann belongs to this class and entered the field at an opportune time. His rise is typical of the success awaiting progressive young men in the Independent telephone field.

W. J. Allison, for eight years manager of the United Telephone Company at Bluffton, Ind., has resigned to accept a similar position with the Bowling Green Telephone Company of Fort Wayne. Mr. Allison is a telephone man of ability as well as experience.

THE VALENTINE-CLARK COMPANY, CHICAGO.

The Valentine-Clark Company, with general offices at 234 La Salle street, Chicago, and yards at Pinconning, Mich., and Green Bay, New London and Prentice, Wis., is one of the well-known concerns in the cedar pole industry, having been established for many years. The company carries large stocks, embracing all lengths and sizes of tops, and is in position at all times to fill orders promptly.



E. H. VALENTINE.

ERNEST L. CLARK.

E. H. Valentine, the company's president, has been a resident of Chicago for over thirty years. He was born in Massachusetts and acquired his early business training through an apprenticeship with one of Boston's oldest and most stanch mercantile houses. Before embarking in the cedar business Mr. Valentine was for an uninterrupted period of twenty years Western manager at Chicago for the Walter A. Wood Mowing and Reaping Machine Company of Hoosick Falls, N. Y., at that time one of the great har-

PENCONNING, MICHIGAN, YARD—THE VALENTINE-CLARK COMPANY.

GREEN BAY, WISCONSIN, YARD—THE VALENTINE-CLARK COMPANY.

NEW LONDON, WISCONSIN, YARD—THE VALENTINE-CLARK COMPANY.

PRENTICE, WISCONSIN, YARD—THE VALENTINE-CLARK COMPANY.

vesting machine manufactories of the country. Mr. Valentine is a gentleman of high attainments and many sterling qualities.

Ernest L. Clark, secretary and treasurer of the company, is a native of Chicago and has been identified with the cedar pole business since 1888. He has a large circle of friends among the telephone and electrical fraternity and is familiarly known to the trade as "Clark, the pole man." He is a young man of engaging personality and gives the closest application to every detail of the company's business. He is a hustler in every sense of the word.

The Valentine-Clark Company is a monument to the business sagacity and untiring effort of Messrs. Valentine and Clark.

KEELEY INSTITUTE SYSTEM.

The progress that telephone manufacturers are making in the production of higher class instruments is exemplified in the new equipment just furnished by the Western Telephone Manufacturing Co., of Chicago, to the Keeley Institute at Dwight, Ill. It is claimed that this is the finest isolated telephone equipment in the world, and embodies the latest form of central energy combination lamp and visual signal devices. The Livingston Hotel of the Leslie E. Keeley Institute at Dwight, Ill., was burned last year. In its place a fine large structure was erected with all modern improvements. The architect and officers of the Keeley Institute gave particular attention to the electrical equipment.

The switchboard, as illustrated in Figs. 1 and 2, is of the central energy, visual signal type, designed for hotel or branch exchange use in combination with a lamp signal and supervisory system for controlling circuits. It is wired to work on a two or three wire common battery system, and has a capacity of one hundred metallic lines, for which it is equipped throughout for immediate operation. In addition to the one hundred visual signals and answering jacks, it is equipped with a complete operator's set; plugs and cords; cam-lever ringing and listening keys; supervisory lamp systems; pilot lamp; monitor buzzer for indicating a line call, and monitor bell and double lamp for indicating a disconnecting signal, the latter being new for this variety of work.

The operation of the switchboard is as follows: When a subscriber takes the receiver from the hook of telephone, the line signal is shown and the buzzer operates on the switchboard, a monitor lamp lighting at the same time. When he is through talking and hangs the receiver on hook the disconnecting lamp is lighted in the supervisory in switchboard, and rings a different signal showing that he is through talking. When the switchboard operator takes out the plugs, the disconnecting lamps go out.

The power plant consists of a storage battery equipment

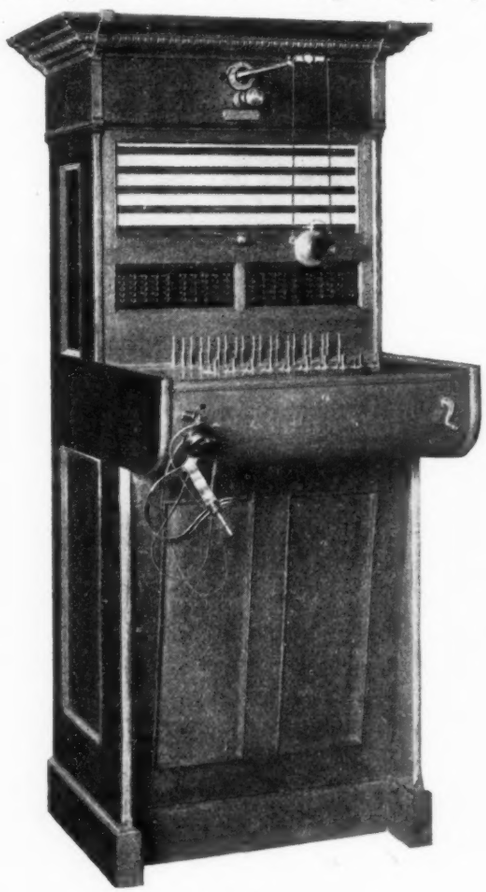


FIG. I.

in duplicate, connected with a power switchboard containing a full line of switches and instruments for controlling the charging and discharging circuits, including a special Weston volt meter, lamps, etc. Besides this, there is an auxiliary set of batteries designed to take the place of the storage bat-

teries in case of an accidental breakdown in the power system. The storage system would ordinarily operate the

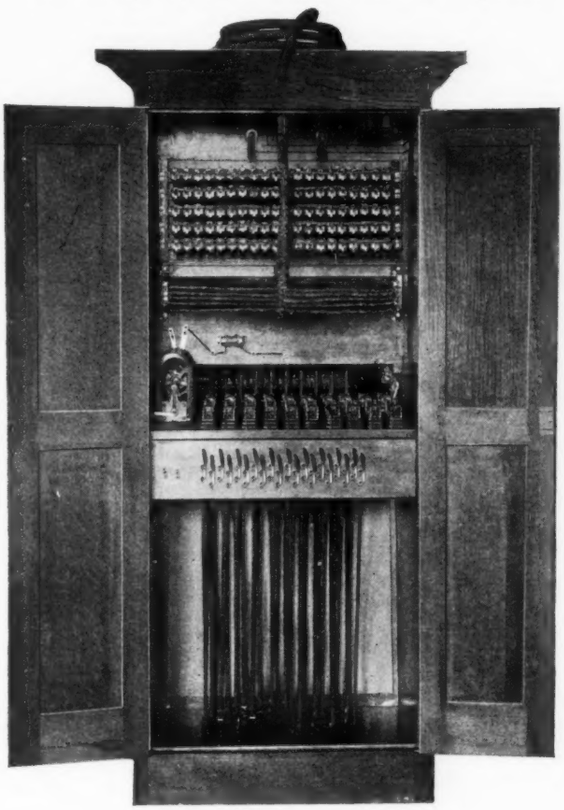


FIG. 2.

plant without power for two or three weeks, but in case of a wreck of the engines or boiler or some other accident that

FIG. 3.

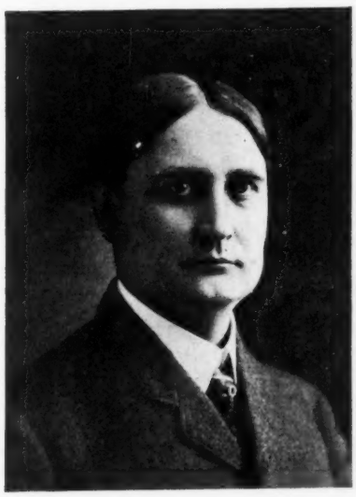
might interfere with the power system for a longer period, this auxiliary set of special batteries would maintain the telephone system in constant operation by simply throwing over a switch on the switchboard.

The telephones are designed to work on common battery call system, and are complete with granular carbon transmitters, bi-polar receivers, platinum contact switch-hooks, double coil and double gong type of ringers of unique and simple design. These are mounted in handsome quarter-sawed light oak, antique oak and golden oak wood-work, to correspond with the wood-work of the various rooms and offices in which the instruments are located. The operation of the telephones is of the automatic type. A call for central office is made by taking the receiver from the hook, and the disconnection, after conversation, is called for by replacing the receiver.

The Western Telephone Manufacturing Co. has shipped, during the past month, several of these systems; one of these, for a large Baltimore concern, sold through a leading Eastern telephone company, is similar to cut No. 3 illustrated herewith. It is provided with the Western express magneto, self-restoring drop and is designed for a combination of series and toll line drops. The desk pattern makes it convenient for the operator who has other duties of a clerical nature. The Western Telephone Manufacturing Co., which controls the pioneer Independent telephone factory, has made remarkable strides during the past three months. Many new designs have been placed on the market, and its factory is working overtime at the present. Its orders are more than can be filled for some time to come. The company is arranging to greatly enlarge its facilities, which indicates a prosperous condition.

JAMES E. PLEW.

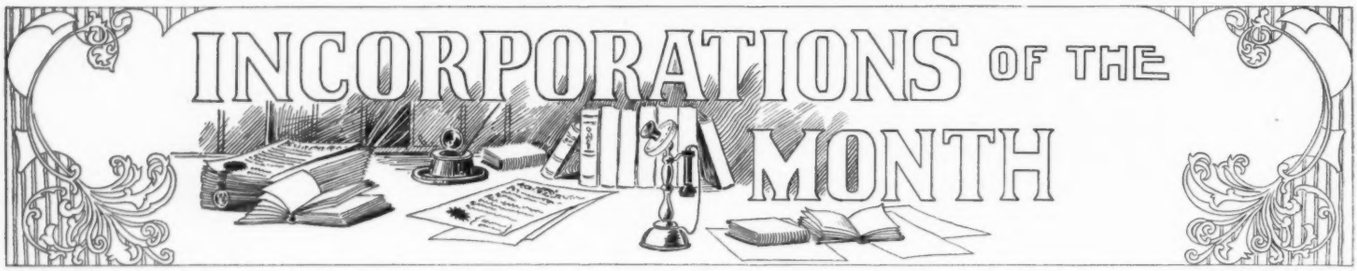
The subject of this sketch, James E. Plew, was born in Illinois in 1862. In 1885 he organized the Chicago Towel & Supply Company, later embarking in the bicycle industry in 1896, making the famous soft nose saddle, which business was purchased by the trust in 1900.



In 1899 Mr. Plew began his experiments on a telephone meter for measured service, which mechanism he now has ready for the market.

Uniform success has marked all of Mr. Plew's ventures in the commercial world and his progressive business methods have made him known to a wide circle.

Mr. Ezra Torrance Gilliland died of heart failure at his residence in Pelham Manor, N. Y., 4 a. m., May 13. Mr. Gilliland was a pioneer telegraph operator and telephone inventor. He became an expert telegraph operator about the time of the commencement of the civil war. When the telephone was invented he became interested, both as a manufacturer and inventor. His patents related to central office apparatus, magneto call bells, etc., and his work was considered of first importance in advancing the development of the telephone. He was associated with Edison a number of years. Of late he has not been so active in electrical work and has resided at Pelham Manor. He leaves a very wide circle of electrical friends.



Platte Valley Telephone Company, Scott's Bluff, Neb.

Scranton Telephone Company, Scranton, Kans. Capital stock, $1,000.

Farmers' Mutual Telephone Company, Utica, Ia. Capital stock, $9,000.

Farmers' Telephone Company, Quimby, Ia. Capital stock, $10,000.

Citizens' Telephone Company, New York, N. Y. Capital stock, $50,000.

Union Telephone Company, California, Pa. Capital stock, $10,000.

Citizens' Telephone Company, New York, N. Y. Capital stock, $50,000.

Union Telephone Company, California, Pa. Capital stock, $10,000.

Ogden Telephone Company, Boone, Iowa. Capital stock, $25,000.

Madelia, Telephone Company, Madelia, Minn. Capital stock, $10,000.

Oakalla Central Telephone Company, Oakalla, Ind. Capital stock, $200.

White Creek Telephone Company, White Creek, N. Y. Capital stock, $3,000.

West Wisconsin Telephone Company, Glenwood, Wis. Capital stock, $5,000.

Farmers' Mutual Telephone Company, Emmons, Minn. Capital stock, $10,000.

Eureka Telephone and Telegraph Company, Osage, Ia. Capital stock, $100,000.

Jewell and Wall Lake Telephone Company, Jewell, Iowa. Capital stock, $2,500.

Northern Indiana Telephone Company, Logansport, Ind. Capital stock, $10,000.

Rural Telephone and Telegraph Company, Batesville, Miss. Capital stock, $5,000.

Hawaiian Telephone Company, Wailuku, Hi. Incorporators: S. Ahmi, J. P. Silva, Y. Young.

Sulphur Springs Co-operative Telephone Company, Sulphur Springs, Ind. Capital stock, $7,000.

Kaw Valley Telephone and Electric Light Company, Bonner Springs, Kans. Capital stock, $15,000.

Darien Telephone Company, Darien, N. Y. Directors: D. C. Young, N. Harper, E. J. Shrim. Capital stock, $800.

St. George Telephone Company. St. George, S. C. President, M. S. Cannon; secretary, R. L. Weeks. Capital stock, $5,000.

Flushing Telephone Company, Flushing, Ohio. President, E. N. Holloway; secretary, V. N. Marsh. Capital stock, $25,000.

Chazy Telephone Company, Chazy, N. Y. Incorporators: A. W. Fairbank, Seth Gordon, W. H. Robinson. Capital stock, $3,000.

Ney Telephone Company, Ney, Ohio. Directors: A. P. Yeagler, W. G. Galler, P. M. Lehman, O. Welker. Capital stock, $10,000.

Friendship Telephone Company, Graymont, Ill. Incorporators: Frank Weber, A. C. Piper, L. B. Snyder. Capital stock, $2,500.

Rushville Telephone Company, Rushville, Ill. Incorporators: L. A. Jarman, A. P. Rodewald, David Glass. Capital stock, $5,000.

Parsons Telephone Company, Parsons, W. V. Incorporators: Riley Harper, J. P. Scott, W. H. Clayton. Capital stock, $10,000.

Home Telephone Company, Camargo, Ill. Incorporators: Eugene Rice, G. C. Jeffers, W. C. Wisemann. Capital stock, $46,000.

Alto Telephone Company, Alto, Wis. President, Ed. Bruins; secretary, Henry Shepard; treasurer, Ed. Bruins, Jr. Capital stock, $3,000.

Southwestern Telephone Company, Weatherford, Okla. Incorporators: J. M. Noble, E. N. Westervelt, E. D. Nims, D. V. Harris.

Roaring Springs Telephone Company, Greenville, Tenn. Incorporators: H. A. Simpson, R. A. Mercer, T. N. King, J. D. Brown.

J. E. Eckhart Telephone Company, Buck Creek, Ind. Directors: John E. Eckhart, J. E. Eckhart, F. M. White. Capital stock, $10,000.

Home Telephone Company, Compton, Cal. Directors: A. J. Shepard, W. L. Frew, E. E. Moore, J. L. Shepard. Capital stock, $25,000.

Citizens' Telephone Company, Lawrenceville, Ill. Incorporators: J. R. Dickinson, J. N. Spangler, C. W. Parkinson. Capital stock, $25,800.

Jackson Telephone Company, Preston, Ia. President, N. J. Milhaem; secretary and treasurer, F. B. Potter. Capital stock, $25,000.

Seneca-Gorman Telephone Company, Seneca, N. Y. President, John A. Driscoll, Rochester; secretary and treasurer, D. S. Allen, Seneca.

Brooklyn and Wampler Lake Telephone Company, Norvell, Mich. Directors: Ed. Hoxsie, Harry A. Blum, Chas. Dresser. Capital stock, $250.

Marshall Telephone Company, Marshall, Okla. Incorporators: Oscar Leafquist, B. W. Murphy, W. L. Helter and others. Capital stock, $1,200.

Jelm Mountain Telephone Company, Jelm, Wyo. Directors: Wm. D. Edmonds, Oscar Sodergreen, Frank T. Wyatt. Capital stock, $5,000.

The Champlain Telephone Company, Peru, N. Y. Incorporators: Walter N. Thayer, Jr., N. R. Weaver, Datus Clark. Capital stock, $3,000.

Red Jacket Telephone Company, Manchester, N. Y. Incorporators: Carlos Osgood, John H. Pratt, Olive S. Titus. Capital stock, $5,000.

Jefferson Telephone Company, Madison, Ind. Incorporators: Wm. Kirk, Wm. A. Kirk, J. M. Benson, John McGregor. Capital stock, $10,000.

Farmers' White Line Telephone Company, Mt. Comfort, Ind. Directors: David Keller, Martin V. Collins, D. S. Wright. Capital stock, $1,500.

Nebagemain Telephone Company Lake Nebagemain, Wis. Incorporators: Fred G. Johnson, Bernard Skare, R. G. Ogilvie. Capital stock, $5,000.

Consolidated Telephone Company, Washita, Okla. Incorporators: M. E. Blake, Otto A. Shuttee and others, of El Reno. Capital stock, $500,000.

Clifton Springs Telephone Company, Clifton Springs, N. Y. Incorporators: Wm. H. Burke, Harry E. Flint, H. L. Wright. Capital stock, $6,000.

Marysville Telephone Company, Marysville, Ohio. Incorporators: Geo. C. Whitney, N. E. Liggett, W. A. Shawen, R. L. Woodburn, B. F. Harmon.

Camden and Atlantic Telephone Company, Camden, N. Y. Incorporators: Wilfred B. Wolcott, C. E. Wilson, Norman Grey. Capital stock $200,000.

International District Telephone Company, Newark, N. Y. Incorporators: R. M. Beard, S. W. Slayder ,J. H. Reid, B. A. Judd. Capital stock, $100,000.

Briggsville and Big Springs Telephone Company, Briggsville, Wis. Incorporators: J. T. Kimball, A. L. McDonald, W. C. Kimball. Capital stock, $2,000.

Polo and Richmond Telephone Company, Polo, Mo. Incorporators: L. B. Craven, Samuel Clevinger, J. C. Crowley and others. Capital stock, $2,500.

Riverton Telephone Company, Riverton, Neb. Incorporators: M. R. Hobart, Fred Hunter, L. E. Bowers, B. W. Shepherdson, J. S. Wickstrom, H. B. Holmes.

Cosam, Camp Ground and Mt. Vernon Telephone Company Cosam, Ill. Incorporators: J. G. Williams, G. W. Clark, W. W. Duncan. Capital stock, $2,500.

Waterloo, Buffalo and Windfield Telephone Company, Waterloo, W. Va. Incorporators: Chas. Baxter, Chas. Riffle, E. E. Cosson. Capital stock, $5,000.

Clearwater Telephone Company, Clearwater, Minn. President, G. B. Boutwell; secretary, W. Frantzer; general manager, J. H. Whitney. Capital stock, $10,000.

Lacona and Milo Telephone Company, Lacona, Ia. Incorporators: John Bauer, Alva B. Miner, Andrew Bauer, T. Sheffer, L. A. Bauer. Capital stock, $2,250.

Caroline Telephone Company, Slaterville, N. Y. Directors: O. D. Nulks and W. C. Gallagher of Slaterville and H. D. Thomas of Brookton. Capital stock, $10,000.

Polo and Richmond Telephone Company, Lawson, Mo. Directors: Judge A. Gordan, O. L. Kincaid, Thos. Hankins, Van Wall, G. E. Higdon. Capital stock, $2,500.

Dillonvale Telephone Company, Dillonvale, Ohio. Incorporators: T. C. Willard, E. J. Primley, C. W. Dille, A. Carrubine, W. H. Ward. Capital stock, $10,000.

Grant County Telephone Company, Elbow Lake, Minn. Incorporators: Wm. E. Sandreene, L. V. Barnes, Henry Sampson, Edward Scofield. Capital stock, $20,000.

Crescent Mutual Telephone Company, Osceola, Iowa. Incorporators: Ed. Bell, president; Wm. Bell, secretary; Wm. Leeson and T. H. Swain. Capital stock, $400.

Leger Telephone Co., Leger, Okla. Incorporators: R. K. Wooton of Chickasha, I. T., and W. T. Talley and John B. Jones of Granite, Okla. Capital stock, $5,000.

Co-operative Telephone Company, Portland, Ind. Incorporators: D. M. Baker, C. N. Hardy, Portland; A. M. Poland, J. B. Andrews, Red Key. Capital stock, $10,000.

Number Eight Telephone Company, Owensville, Ind. Directors: John D. Thompson, Jas. E. Benson, Benj. A. Mauch, Henry Mauch, Thos. N. Born. Capital stock, $750.

Onawa and Monona Telephone Company, Onawa, Ia. Incorporators: Fred Marquis, J. W. Hoff, G. W. McMullen, S. B. Martin, C. H. Huntington. Capital stock, $100,000.

Cherokee County Telephone Company, Cherokee, Iowa. Incorporators: H. W. Petersmeyer, Chas. G. Cockerill, P. C. Cockerill, Ira Conger, C. H. Smith, M. M. Head. Capital stock, $100,000.

Farmers' Mutual Telephone Company, Emmons, N. Y. Directors: H. M. Burgerson, P. S. Peterson, Geo. C. Emory, K. N. Troe, L. A. Larson, O. A. Thompson, S. L. Davidson. Capital stock, $10,000.

Kansas Telephone and Telegraph Company, Kansas City, Kans. Directors: Ed. J. Hall, Ed. J. Meany, of New York; L. G. Reynolds, C. Angevine, C. K. Cubbison, Kansas City, Kans. Capital stock, $25,000.

Local Union Telephone Company, Washington County, Ind. Incorporators: F. T. Morris, William Morris, R. W. Morris, Wilson Gibbins, L. B. Packard, Virgil Houston, Wylie Steward. Capital stock, $25,000.

Farmers' Mutual Telephone Company, Dallas Center, Ia. Incorporators: H. M. Shamel, Will Lehmen, R. F. Rinehart, A. J. Wise, H. G. Hobb, Clyde T. Brenter, C. E. Repars, J. Royer. Capital stock, $20,000.

Del Rapids Farmers' and Merchants' Telephone Company, Del Rapids, S. D. Directors: M. R. Kenefick, O. F. Bowles, M. A. Dieson, H. O. Rime, O. O. Sawyer, L. K. Larson, Henry Robertson. Capital stock, $15,000.

Interstate Telephone and Telegraph Company, Augusta, Me. Incorporators: N. H. Moulton, Minneapolis, Minn; L. L. C. Brooks and F. C. Nelson, St. Paul, and F. F. Betton and E. F. Whittan. Capital stock, $6,000,000.

Columbus Automatic Telephone Company, Columbus, Ga. President, John T. Norman, Columbus; vice president, C. B. Lloyd, Toledo, Ohio; treasurer, Frank Hart, Toledo; secretary, Geo. P. Young, Columbus. Capital stock, $1,000,000.

S. A. Dinsmore has just returned to Chicago from an extended Southern trip.

Leroy W. Stanton, consulting telephone engineer of Cleveland, Ohio, was a recent Chicago visitor.

Angus S. Hibbard, general manager of the Chicago Telephone Company, has been made second vice-president.

President Frank E. Bell of the Interstate Telephone Company, Odon, Ind., was in Chicago the early part of the month.

Hon. W. Murray Crane has been added to the executive committee of the American Telephone & Telegraph Company. He has been associated with the Bell system for some time.

Joseph Lockey of St. Paul has been succeeded as vice-president of the Twin City Telephone Company by L. L. C. Brooks, also of St. Paul.

J. B. Spruance has resigned the management of the Sheffield (Ala.) telephone exchange, and is succeeded by Louis V. Massey of Tuskegee.

G. W. Leyda of the Union Electric Telephone and Telegraph Company, Rock Island, Ill., was in Chicago recently in the interests of his company.

J. E. Brada, secretary and treasurer of the Antiseptic Telephone Appliance Company, Hoboken, N. J., was a recent business visitor in Chicago.

Robert B. Abbott has recently severed his connection with the Chicago branch of the John A. Roebling Son's Company and is at present open for a position.

Dr. Lee De Forest has been visiting Seattle, Wash., with the object of establishing wireless telegraph stations along the Pacific coast and possibly across to Asia.

Geo. W. Conover, purchasing and forwarding agent for Independent telephone companies, with headquarters in Chicago, has recently returned from a successful business trip through the eastern states.

Frank B. Cook of Chicago, the well-known manufacturer of protective devices, has just returned from a flying trip to the Pacific coast and reports that Independent telephony is flourishing on the coast.

H. L. Canfield, who controls the interests of the Delphos, Ohio, Electric Light & Power Company, has been granted a 25-year franchise by the city council for a telephone system, and will install an up-to-date exchange plant.

Dr. W. M. Habirshaw of the India Rubber & Gutta Percha Insulating Company, has returned home to New York from a long trip through the West Indies and the far Southern states. The end of the winter found the veteran expert in rather poor health, but his holiday has done him considerable good.

Mr. Hugo Reisinger of New York City, well known in the electrical trade, has been appointed honorary commissioner to Europe of the Louisiana Purchase Exposition Company. Mr. Reisinger has for some time past been acting as the exposition's New York committee for the reception of distinguished foreigners arriving in this city from Europe.

V. H. Yarnall, manager of the American Vitrified Conduit Company, Broadway-Maiden Lane building, New York city, is on his way to Russia to superintend the laying of the conduit for the St. Petersburg municipal telephone system. This contract was awarded by the St. Petersburg city council, and the articles call for all the conduit that can be laid this summer, the minimum being stated as 1,000,000 duct feet. About 900 tons or 220,000 feet of two-duct conduit, twenty-four inches long, have already been shipped. Mr. H. B. Thomas, assistant manager, will be in charge of the New York office, Mr. S. A. Douglass acting as sales manager.

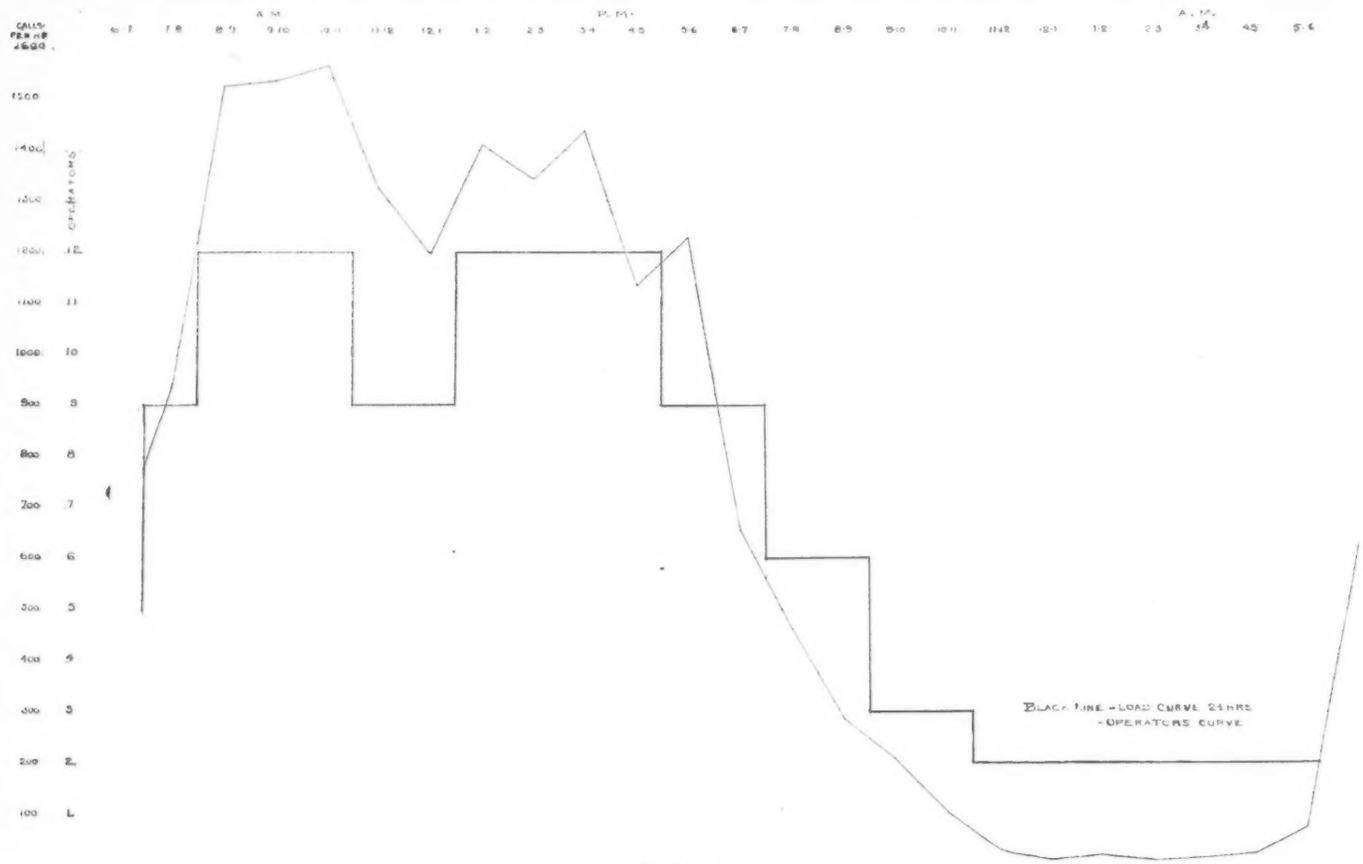
TELEPHONY is a few days late, this month, because of a fire that wrought temporary havoc with the press room of the Western Newspaper Union, printers of this publication.

ECONOMY OF EXCHANGE OPERATION.*

Your executive committee has honored me by requiring a paper on the ecenomy of exchange operation, which covers, in my opinion, the most extensive and far reaching branch of telephony.

Fortunately for you, and more fortunately for me, the committee has limited the time to ten minutes. It is unnecessary, therefore, to call your attention to the fact that the subject mentioned can not be gone into in detail.

For successful exchange operation it is necessary to know the machine you are operating. It is possible for an operator to perform only a given amount of work. The load curves of all switchboards show a gradually ascending and descending line at almost a constant rate of increase and decrease. The number of operators necessary to handle a given load is determined absolutely by the amount of work required performed in a given time. The switchboard load must be evenly distributed in order to secure a standard of operation, and the operators must be so distributed in hours of service as to obtain parallelism between the load and the handling of the same.



SHEET I.

In some visual multiple switchboards the highest speed is obtainable and consequently the greatest economy. In speaking of a high standard of operation, it is meant, of course, that each operator is familiar, not only with her duties in connection with the physical handling of the apparatus, but also in the courteous and intelligent treatment of the telephone users. Uniformity is also highly essential.

It must be clear to you from all of the above that an unequally loaded board is productive of poor operation and precludes the possibility of maintaining any standard. It is a well established fact that the operator who is idle the greater part of her time becomes thoroughly inefficient and operators on overloaded positions rightly conclude they are overworked. Primarily the economical operation is the maximum efficiency with the minimum of energy expended.

It has been suggested in connection with this paper that it is far better to make definite and conclusive an idea of value than to fall headlong into the entire telephonic proposition, and the writer believes that the outline of operation given above is ample in its scope to secure the result desired; that is, to standardize switchboard loads and the handling of the same.

The history of Independent telephony goes to show that the first position on the board is usually loaded with business houses of all descriptions, without reference to the ultimate probable switchboard load. With the knowledge that any system is better than no system, it is infinitely better to load each board with one-third business lines and two-thirds residence lines than to indiscriminately place all business lines or all residence lines in one position. Ninety-nine Independent companies out of every one hundred are necessarily located in cities where the Bell service is already established, and the probable use of a subscriber's instrument, although it may require time to secure the information, should be determined for equalizing the load on the switchboard. In the matter of pay stations the same rule should be followed, bearing in mind that where long distance service is contemplated through the local board it is impossible to handle more than from 20 to 40 per cent of the volume of business cared for by local operators.

In the cases of multiple switchboards, equipped with an intermediate rack, it is possible to equalize to a greater extent than in other systems. The item of switchboard maintenance effects to a greater or less degree certainly the successful, if not economical, operation of an exchange and should be most zealously guarded.

*Paper read by J. V. L. Turner at Columbus, Ohio, May, 1903.

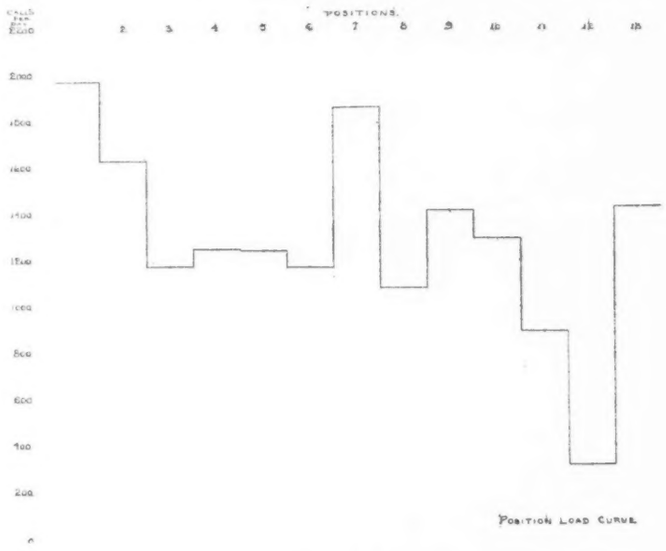
You will notice that position 1 on sheet 1 shows about 2,000 calls for 24 hours. Assuming from the load curve that 80 per cent of these calls occurred between 9 a. m. and 5 p. m., the operator will have made 1,600 connections on an average of 200 per hour, requiring for each connection 18 seconds.

Position number 8 shows that about half this number were made, requiring for each connection 36 seconds. Further assuming that the average calls per subscriber per day equals 10, and upon the same basis as the load is calculated, 80 per cent of this would give one call per hour per subscriber.

The line on sheet 2, representing the operators on duty, will immediately show that this exchange has reached its economical limit as to number of operators required.

Position 1 on sheet 1 shows an abnormal condition, and with the usual objection of the subscriber to having his number changed and no intermediate rack available, precludes the possibility of any other arrangement of operators being made, and in addition to all of the foregoing, it must be borne in mind that the seasons of the year also control largely the situation.

The position load line and the operating load line will change materially from time to time. Relieving the switchboard of one operator during the period of low operating



SHEET 2.

line would mean, during the period of a high operating line, a new operator and consequently poor service.

The operator at position 2 on sheet 1 when taking care of position 1 can not keep down the line on position 2 and 1 at the same time, for the reason that she also assists to keep down the line on position 3.

The actual number of calls on position 1 on this diagram is about 2,430, but for obvious reasons was placed below 2,200.

On position 7, sheet 1, it will be noticed that the load is also abnormally high, and this is accounted for only by the fact that it is excessively overloaded.

Positions 9 and 10, as also 3, 4, 5, and 6, are nearly normal, while positions 8 and 11 are underloaded, and the proper line in the case of position 8 should be 300 calls for the position. It is very easily determined, therefore, that the standard of operation and its uniformity, coupled with discipline, is exceedingly high.

Position 12, where the highest possible type of efficiency is required, is devoted exclusively to private branch exchange trunks and therefore necessarily appears low, no assistance being given by either position 11 or 12 to each other.

If positions 1 and 3 were reversed, the position load would have an entirely different appearance, as is also the case with positions 7 and 9.

With the shifting of the load, as suggested in the foregoing, we would not reduce the number of operators. If the scheme was carried out in its entirety, and an intermediate rack placed, the result would be the cutting down of one or two positions and thus reducing the number of operators employed.

If the operators were all of the same class, of the same training and worked in positive unison, the entire line, which would be almost a continuously horizontal one, could be raised without any difficulty to 2,000 calls per day per position, thus still further decreasing the actual number of operators required. The load curve and calls per subscriber per day would not of course in this case be effected.

In conclusion, I wish to lay particular stress upon the condition that must obtain. The entire operating force, particularly on adjoining positions, should entertain for each other the best of feeling, otherwise the relief necessary at certain hours will not occur. Operators with petty differences will not help each other, and consequently the position load will not remain constant.

MINNESOTA INDEPENDENT TELEPHONE ASSOCIATION.

The second annual meeting of the Minnesota Independent Telephone Association was held May 21 and 22 in Minneapolis to discuss plans for the various lines which are to be extended throughout the state and make arrangements for representation at the seventh annual convention of Independent Telephone Associations of the United States, which is to be held in Chicago June 24 and 25. A large number of telephone men from various parts of the state were present.

Dr. J. H. James of Mankato, the president of the state organization, gave a lengthy address, in which he outlined the policy that was to be pursued, and gave in detail the movements that have been under way for the past year. He stated that the Independent lines were steadily receiving more patronage and that affairs are in much better shape than ever before.

The election of officers resulted as follows: Dr. J. H. James, Mankato, president; J. A. Tawney, Winona, first vice-president; E. L. Bradley, Duluth, second vice-president; Dr. E. R. Robinson, Norwood, third vice-president; B. F. Clarke, Hector, secretary; E. H. Moulton, Minneapolis, treasurer.

NO WISCONSIN TELEPHONE CONVENTION.

The following letter from the president of the Independent Telephone Association of Wisconsin, which is self explanatory, has been received as TELEPHONY is going to press:

Janesville, Wis., May 29, 1903.

Editor of TELEPHONY, Chicago, Ill.

Dear Sir:—Please announce to your readers that the executive committee of the Independent Telephone Association of the state of Wisconsin has decided not to hold a summer meeting during 1903. The national association meets in Chicago upon the date we had selected for our summer meeting, and we do not want to interfere with that meeting, although ours was selected first.

Yours truly,
Richard Valentine, President,
Independent Telephone Association of Wisconsin.

The Delaware, Lackawanna & Western railroad is equipping its entire system with a telephone system.

The Farmer Line Problem.

Paper read at Columbus, O., May 12, by O. F. French.

To consider the different phases of the problem in logical sequence, it is only natural at the outset to inquire into the necessity and desirability of such service. As for the many benefits to be derived by the farmer, it would be but a waste of time to enumerate same. It may have been necessary several years ago to put up a fairly strong talk backed up by statistics, to convince the prospective farm subscriber of the merits of telephonic connection with the outside world; but to-day most of us are enjoying the experience of having committees of country people representing their respective neighborhoods come to the telephone office and make request for telephone service. As far as the telephone company is concerned, the matter is a business proposition wholly, and consequently the first question is, will it pay? As to the prestige which such business would bring, there can be no question, for it is a well-known fact that "business begets business."

Again, there is no doubt that there is less movement among this class of subscribers than among any others; consequently the cost of transferring telephones is a minimum. Furthermore when you once gain the confidence and good will of the farmer, you have a subscriber who will stand by you for all time. Notwithstanding these good features of the proposition, the one which really appeals to capital and the one which sentiment does not sway is, what will be the net results in dollars and cents? The factors which determine the answer to the latter question are, construction cost, operating and maintenance expenses, and depreciation. I consider, and the experience of a vast number of operating men will bear me out, that the most important of these factors is the one of construction.

Experience proves, and most decidedly, that although there is no doubt a limit to the amount of money that should be spent on a farm line, in no other department of telephone development should more care be taken; for naturally maintenance expenses depend largely upon the quality of line construction and equipment. After careful study of this problem it was decided long ago by the company which I represent that on any line which required crossarms, nothing smaller than 25 ft. 6 in. top poles set thirty-five to the mile should be used, and for subscribers within a radius of ten miles from the exchange, a metallic circuit of No. 12 B. B. iron wire is specified, beyond that limit No. 10 wire. The guying of the telephone line is of the utmost importance and if this part of the construction is well done, the stability of the line is assured and the breakage of line wire brought to a minimum. Another feature which must not be lost sight of is the equipment. Good service depends upon nothing so much as the use of the best telephone instruments obtainable. To-day considering the state of the art, there is no excuse for the employment of poorly made instruments. On farm lines with ten or less subscribers to the line, I would recommend any standard 4-bar generator 1000 ohm ringer telephone.

As far as the operating is concerned, the expense of this department is comparatively low, but still in the aggregate it amounts to something and must be taken into consideration.

As mentioned before, maintenance expense depends largely upon quality of construction; but assuming that standard work has been done, maintenance cost is affected principally by weather conditions, and this calls to mind one of the important features of maintenance, that is, proper lightning protection. The same reasoning would apply here as in the case of the quality of construction, and intelligent consideration would result in the employment of nothing but the best lightning and sneak current protection to be had. It would seem to me that in combination with a mica fuse and carbon arrester at the instrument, a manually operated switch mounted in a weather-proof box should be placed directly outside the building in which the instrument is located, the subscriber to be instructed to set the switch upon the approach of a storm in a position to disconnect the telephone instrument and connect the line through a lightning protector to ground. The farmer would naturally feel safer and the result would be, should a static discharge take place over the line, that neither the instrument nor the protection at the instrument would be damaged, and consequently it would not be necessary for a trouble man to take an expensive trip to merely renew a damaged arrester or possibly an induction or ringer coil. The managers present certainly appreciate that such trips form no small part of maintenance expenses during the summer months. In some localities on account of severe electrical storms, it has been found necessary to insist that the suburban subscriber come to the telephone office and transport the trouble man to and from the location of the cause of trouble. This agreement is sometimes stipulated in the telephone service contract.

The other factor which has been much discussed within the last few months, but which is little understood, is the one of depreciation. The question of the deterioration of a telephone plant depends in a great degree upon location, environments and the standard of maintenance. I firmly believe if a plant in this territory is even properly maintained that at least 5 per cent of the property cost should be set aside or charged off yearly.

As a problem, let us consider an average line six miles in length, and that twenty-five parties uniformly located along the last five miles of line have contracted for service. Based upon the above specifications and the best prices obtainable on labor and material, the estimated cost of the installation of twenty-five subscribers five per circuit would be as follows:

Poles	$ 525.00	
Cross arms and fixtures	210.00	
Wire	400.00	
Guying	60.00	
Telephone instruments	312.50	
Lightning protection	25.00	
Switchboard lines	15.00	
Total	$1,547.50	
Estimated revenue per annum—		
25 subscribers, at $18		$450.00
Estimated expenses per annum—		
Operating	$ 25.00	
Maintenance	100.00	
Taxes	15.00	140.00
Net revenue		310.00
5 per cent depreciation charges		77.38
Amount applicable to stock and bonds		$232.62

The latter amount represents 15.3 per cent on the investment, which percentage is not any too great. On a $12.00 basis the revenue would amount to $300.00, leaving but $82.62 as a surplus, the latter amount representing but 5.3 per cent on the investment. The above comparison would tend to show that good service cannot be furnished at an inviting profit on a rental charge of but $12 per year.

You may have heard the remark that it does not pay to build expensive farm line construction. It has been the writer's aim to show that the reason for any such statement is due to the fact that telephone rental has been placed at too low a figure. Therefore, if you cannot get such business at a rental rate which will warrant good construction, do not take it, for if you do construction and consequently service will be sacrificed to make it possible to eke out a dollar or two in profit.

Suppose, for instance, that the above line should be constructed for one-half the estimated figure, or $773.75, with money worth 5 per cent. What would be the result in comparison to the $1,547.50 investment? First, an annual reduction in interest of $38.69. Second, maintenance would positively be doubled, which would mean an increase in annual expenses of approximately $100. Viewed from any standpoint, the conclusion of the intelligent investor and builder is summed up in these words: "The best construction is none too good."

For the very good reason that city subscribers are in a position to pay more for telephone service than the average suburban subscriber, it follows that there should be more profit in city business, and if but a limited amount of funds is available for new business, it naturally follows that such money should be invested first in taking care of city subscribers and the balance, if any, used in farm line construction. Now, it often happens that there is no balance. Rather than see the good suburban proposition go to the opposition, a number of suggestions have been made to raise the necessary funds for taking care of such business. The following, which I will call call a "preferred stock plan," appears to me as being the best scheme yet proposed. A brief outline of the plan would read as follows:

An issue of 6 per cent preferred stock is to be gotten out; then the prospective suburban subscriber is to be offered $100 shares of preferred stock at par, the interest on same to apply as a rebate on his telephone rental. Therefore, if a subscriber whose telephone rental is $18.00 per year should purchase three shares, the interest on same would take care of his telephone rental indefinitely. The advantage to the telephone company which is under the necessity of employing such means is very manifest; primarily that this particular subscriber has been secured, and secondarily, that enough money has been acquired to take care of several other new subscribers. The question naturally arises, will the proposition appeal to the farmer even though he has the money to invest? I will answer this question as the Yankee generally does, by asking another. If you were getting from 4 per cent down to nothing on bank deposits, would not a proposition which guarantees 6 per cent on the investment be attractive to you? Most assuredly so.

Features of Telephone Traffic and Its Effect Upon Service.*

Traffic, in the strict acceptance of the term, implies the transfer of commodities from one person to another. We may consider exchange of ideas over a telephone wire from one person to another as a form of traffic, and such a construction may put telephone calls within the meaning of the word.

Consider first the part the subscriber plays in telephone traffic and in making good or bad service, for the subscriber's part is an important one and often militates against good service. Who has not called for a number and, after waiting for a few minutes, hung up the receiver with imprecations against the telephone service? In the meantime the telephone apparatus has perhaps performed its functions properly and the operator is in a fair way to get the called subscriber. When the latter answers, he may not have answered promptly, and finds no one on the line, he, and not the calling subscriber, is certainly the aggrieved party. False calls are a frequent and annoying source of complaint against the service and are caused in many ways in addition to the one just named. The calling party may give the wrong number or the wrong office. The number of office may be misunderstood by the operator, or the calling subscriber may change his mind and decide not to make the call. In case the call is from a subscriber in one office to a subscriber in another office, there is always a chance of a misunderstood number resulting in a call for the wrong party.

I recently noticed a curious fact in observing traffic from 10-party line subscribers in a city not 1,000 miles from Chicago. I noted the extreme smoothness and accuracy of the service, the apparent absence of any hitches or complaints, and was surprised when I learned that the operator's load was practically 30 per cent higher than operators' loads in similar service in Chicago. I can explain this condition only by assuming that the operator had the intelligent and courteous co-operation of the subscribers and this was apparent from such observations as I was able to make during a two hours' visit in the office.

Calls should be answered promptly lest they may become lost and the called subscriber lose a chance for an important business transaction. Prompt answering and short conversations will always tend to keep the line free for other inward calls and will minimize busy calls, which more than anything else are a source of bitter complaint.

Practically 20 per cent of all calls made are never completed because the line called for is busy. This feature of telephone traffic is one of the most irritating to the subscriber, but unfortunately is almost beyond the control of the telephone company.

Other things being equal, the busy reports that may be expected from telephone lines will become more numerous and will increase with the number of conversations over that line. In actual practice, other factors enter: The New York City telephones, for example, are reported busy about as often as the Chicago telephones. The number of conversations per line on New York telephone lines is much less than on the Chicago lines. We would therefore ordinarily expect fewer busy reports from the New York lines. The other factors entering in this particular case are undoubtedly shorter conversations by Chicago telephone users and a disposition to rent additional telephone wires where circum-

*A paper read by J. G. Wray before the Chicago branch of the American Institute of Electrical Engineers, May 19, 1903.

stances seem to warrant it. Another factor which has even greater bearing is the fact that the New York City telephone calls are crowded into a shorter day and that hour for hour the lines are nearly as busy as in Chicago.

Leaving further discussion of the part the subscriber may have, we have only to remark that if the subscriber would exercise the same courtesy and good judgment in his use of the telephone that he would show under ordinary circumstances in dealing with his business acquaintances face to face, there would be a marked improvement in the service and the trials of the unjustly maligned telephone operator would be considerably mitigated.

Uniform answering with rapid and accurate service can only be accomplished by giving an operator enough calls to keep her busy and not more than she can handle properly and by minimizing the work on each call. The service may be considered as being good when the average answering is in 6 or 7 seconds, and when say 95 per cent of all calls are answered within ten seconds. This grade of service is obtained only under favorable conditions. The operator must have enough calls to keep her busy, yet not overloaded, and she must be continuously under a competent supervising operator. The practice is to have a supervisor for every eight or ten operators. This supervisor should work under the direction of a chief operator.

A second requisite of good service is that the time and operations required of an operator on each individual call shall be a minimum. Obviously the operator has no time for discussions with the subscribers on the merits of a complaint. These are turned over to the supervising operator for adjustment. It is the aim of the operating manager to so control the two factors just named that good service will result. By the proper manipulation of the intermediate distributing board he may, by increasing or decreasing the number of lines that an operator must answer, keep the operator's load uniform under the fluctuations of traffic.

In a typical telephone exchange the load curve shows during the midnight hours a value of from 1-10th of 1 per cent to 5 per cent of the maximum hourly load. This period of light load will vary from 7 to 14 hours, depending upon the location of the exchange and the habits of the telephone users. In the offices of the business district of a city like Chicago, very few calls are made between 7 p. m. and 7 a. m. Between the hours of 10 p. m. and 7 a. m. the calls per hour will vary from 1-10th of 1 per cent to perhaps 1 per cent of the maximum. Between the hours of 7 and 8 in the morning traffic will rise to perhaps 5 per cent of the maximum. The rise will be extremely rapid until the maximum load of the exchange is reached, between 10 and 11 in the morning. About the noon hour there is a cessation of business and the telephone traffic curve shows a drop of perhaps 40 per cent below the maximum. After the lunch hour, when business has been resumed, the traffic curve rises to an afternoon maximum between 2 and 3 o'clock. This maximum will be less than the maximum in the morning, and will in a typical office approximate 80 per cent of the maximum traffic of the day. From 3 o'clock until 5 or 5:30 p. m. there will be a rapid decrease in the traffic load, with an almost complete cessation of business at 6 o'clock.

In a residence district the slump of traffic at noontime is not very well marked. There is, however, a decrease in the number of calls made late in the afternoon and a corresponding increase in the number of calls for the telephones of a residence district, the latter arising from the fact that the head of the house wishes to explain why he cannot come home for dinner or to announce that he wishes to bring a friend. The evening traffic is also a feature of the residence district. Social calls are made, appointments for the theater, invitations, etc., etc. Evening traffic of a residence district often continues heavy until 9 or 10 o'clock; indeed, in one of the Chicago offices the evening traffic runs from 30 to 60 per cent of the maximum, and heavy traffic is maintained until nearly midnight.

Telephone traffic varies with the seasons as well as with the time of day.

Canal office district of the Chicago exchange shows a fluctuation of 50 per cent between summer and winter traffic. This is caused by the vast number of interests of the district which practically close down during the winter months. There is a heavy rush of traffic in April and May, followed by a 40 per cent reduction in traffic during July and August. In the fall business increases to a maximum in September. This is followed by a 50 per cent reduction in traffic culminating in January. A change in the character of the traffic from Canal district, however, has been noticed within recent years, and the wide variations of traffic with the seasons are less marked. This is undoubtedly due to the change in the character of the district with the gradual building up of vacant prairie with residences, small shops, saloons, etc.

The traffic of all offices slumps decidedly during the summer months. There is a reduction of perhaps 30 per cent during July and August, the vacation period.

The volume of traffic of a telephone exchange is also an unfailing index of general business conditions. This is shown by the fact that during 1894, 1895 and 1896 there was a very slight increase in traffic. With the return of prosperity, however, the traffic has increased by leaps and bounds until now it will approximate four times as heavy as during 1895 and 1896.

The traffic of Saturday forenoon is always the heaviest of the week, and is taken as a basis for the adjustment of operators' loads and the loads on trunk lines. The adjustment of the operator's load must be made with a view of handling the traffic well during the busiest hour of the day. Experience has shown that approximately one-eighth of the business of the entire 24 hours must be handled during the busiest hour.

From the above it can be readily seen that the capacity of the operators and the physical telephone plant must be extremely flexible to take care efficiently of the rapid and extremely wide fluctuation in loads just described.

To the advantage of the telephone manager, be it said that the human machine is extremely well adapted to handling this fluctuationg load. A well-trained operator will frequently take 3 or 4 calls in rapid succession and complete them almost simultaneously.

Just a word on the efficiency of the telephone plant. Assuming an efficiency of 100 per cent when all the subscribers' lines are in use all the time, we find that in actual practice they are working under an efficiency of only 2 or 3 per cent.

Assuming 100 per cent efficiency when the apparatus used by an operator is in use all the time, we find that in actual practice it is working under an efficiency of 25 per cent.

Thousands of dollars' worth of multiple jacks lie in the switchboard, and are practically idle. Some are perhaps never used.

The traffic of a telephone exchange determines the capacity and design of a telephone central station equipment and the size of its operating force. Changes in traffic, whether a decrease due to business depression, a change of contracts to a message rate basis, or to any other cause; or an increase caused by new telephone subscribers, by better business condition or perhaps by a change of policy in the matter of party lines or private branch exchanges, must be met promptly by a corresponding readjustment of facilities and operating force to enable the business to be carried on economically and well.

Good morning, have you given your telephone a bath?

North Electric Company Wins Important Patent Suit.

One of the most sweeping victories that has been gained by the Independent telephone people in this country is that won on May 26, 1903, by the North Electric Company of Cleveland in the Circuit Court of the United States, Northern District of Ohio, before Judge Francis J. Wing. This suit was on the tubular drop, covered by a patent granted June 21, 1892, to James C. Warner and assigned to the Western Electric Company.

This patent covered broadly, if the claims had been sustained, the use of a magnetic shield in annunciator drops for the purpose of preventing cross talk, as well as other magnetic and inductive leakages. This is of importance, owing to the fact that few if any exchanges in the United States do not use tubular drops. All manufacturers, as well as operating companies, appreciate the necessity of the freedom from cross talk thereby secured.

When the North Electric Company set about building switchboards full and complete investigation showed the advantages of a drop with a tubular shell made of soft iron similar to that manufactured by the Western Electric Company for the Bell operating companies. The defendant became satisfied that the patent was invalid and decided to make the best drop possible, in spite of a threatened law

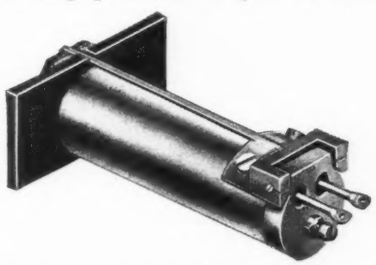


FIG. 1.—NORTH ELECTRIC CO.'S DROP.

suit. A drop practically identical with the Western Electric Company's Warner drop was decided upon and manufactured. Fig. 1 shows the North Drop, which was the one sued upon.

This suit was brought some time since against the North Electric Company, Chas. H. North and Geo. C. Steele, who, through their counsel, Mr. Albert Lynn Lawrence of Cleveland, have conducted a defense which redounds to the credit of both client and counsel. All of the legal forces of the

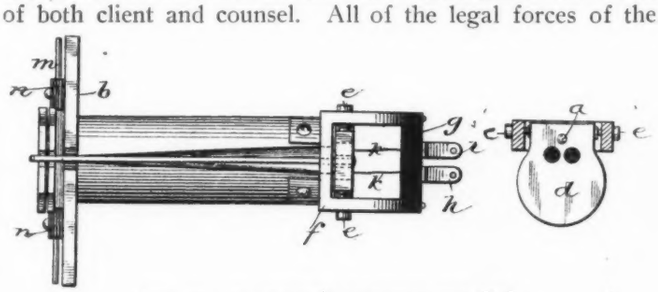


FIG. 2.—WARNER'S PATENT 477,616.

Western Electric were brought to bear on this case, as well as some of the best experts known in the Independent and Bell fields. Every effort was made by the latter company to sustain the patent, and the fiercest fight was maintained throughout.

An elaborate and complete defense was put up by the defendant as against the contentions of the complainant, and every step was taken to prevent an adverse decision. One of the contentions made by the defendant—namely, that there was lack of novelty and therefore no invention, was fully sustained by Judge Wing, who dismissed the suit and entered up costs against the Western Electric Company.

The patent in suit to James C. Warner, 477,616, was applied for June 17, 1889, and was issued June 21, 1892.

Two claims, the first and fourth, were relied upon by the Western Electric Company as having been infringed, which claims read as follows:

"1. The combination, with the coil or helix, of a soft iron shield surrounding the same, the armature at the rear of the core of said helix, and the armature lever extending forward through a slot or opening in the plate *b*, and the drop with which said lever is adapted to be engaged when the drop is lifted, and to be disengaged therefrom when the armature is attracted, substantially as and for the purpose specified."

"4. The annunciator provided with the armature *d*, provided with openings, the ends of the wire of the helix being carried back through said openings in said armature, and connected with insulated connecting pieces *h*, *i*, respectively, substantially as and for the purpose specified."

The patent itself refers to a prior patent, 266,405, dated October 24, 1882, showing an annunciator drop, having the structural features described in the first claim, with the exception of the "soft iron shield" surrounding the magnet

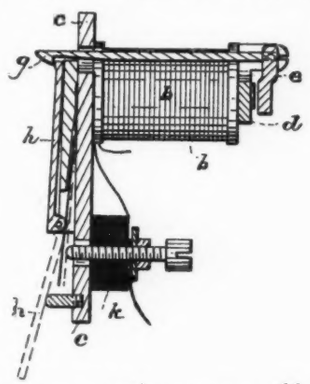


FIG. 3.—WARNER'S PATENT 266,405.

winding, and the alleged novelty of said claim, therefore, rests solely upon the provision of this soft iron shield, surrounding the helix of the annunciator.

Claim 4, in turn, relies for its novelty upon the means employed for carrying out the ends of the magnet winding, and providing connecting pieces at the rear of the armature, with which the wires of the telephone circuit are adapted to be connected.

With reference to the objects sought to be secured by the patentee in providing the structures of these two claims, the patent has to say:

"My invention relates to electric annunciators of the class usually employed as individual signaling devices in telephone exchange systems, and its objects are first, to provide a soft iron shield about the coil, so as to prevent as far as possible inductive effects between the coils of the different magnets when placed near each other, * * * and fifth; to provide for carrying out the ends of the wires of the coil of each annunciator to separate connecting pieces at the rear, so that they may be readily accessible."

The other features of Warner's invention, set forth at some length in the patent, need not be alluded to here, since they were not in issue in the suit nor passed upon by the court.

Reference to the file wrapper and contents of the Warner

patent in suit discloses the citation of five patents upon annunciator drops, none of which exhibits the use of a magnet having the inclosing shell of soft iron, although present in numerous structures of the prior art.

One patent, that to Sawyer, 242,055, dated May 24, 1881, attempts to describe the mounting of a circuit terminal in a manner similar to that adopted in defendants' apparatus; said terminal extending through an opening in the armature and in the patent being used for connection with the alarm circuit of the annunciator.

The patentee accordingly amended the last claim to set forth the specific feature of carrying back the wires of the magnet winding through openings in the armature to the connecting pieces disposed upon an insulated frame at the rear of said armature, thereby securing the allowance of the claim, but differentiating, as the defendants successfully contended, from the structure manufactured by them.

As to the alleged novel feature of the first claim—namely, the soft iron shield surrounding the magnet winding, a very technical question was brought into the case.

Defendants showed by the introduction of a number of patents that soft iron inclosing cases had not only been applied very early to magnet windings, but that these cases had as well been used in connection with telephone apparatus.

The earliest disclosure of this type of magnet is made in the patent to Cabell, 67,410, dated August 6, 1867, showing its application to a combined telegraph relay and sounder.

A more important disclosure, however, is that of the British patent to Faulkner, 1,800, of May 14, 1875. This early patent contains a brief but quite explicit discussion of the peculiar qualities of magnets having cylindrical, soft iron casings, and sets forth the application of this type of magnet to some half dozen different kinds of electrical appliances.

The structure of Fig. 4 of the patent discloses the employment of this type of magnet in an "indicator" or annunciator differing somewhat, though not materially, from the general types of annunciator which subsequently came into use in telephone switchboards.

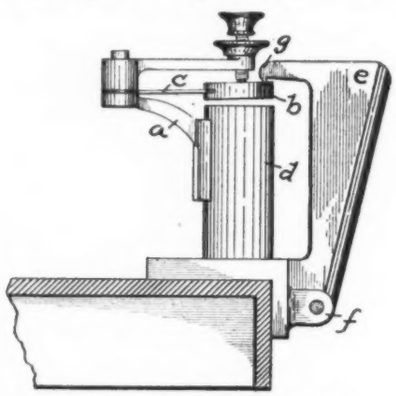


FIG. 4.—FAULKNER PATENT.

This old annunciator is of sufficient interest to merit a brief discussion in connection with the illustration setting forth its features. It comprised tubular iron shell *d*, surrounding the magnet winding, and mounting upon the frame *a* by means of a spring *c*, the movable armature *b*. A drop *e* forwardly pivoted at *f* is normally retained in its upright position by means of the hook *g*, which engages the armature *b* when the same is not attracted by the magnet *d*.

The experts both for complainant and defendant agreed that this structure would effect the result—namely, the prevention of cross talk, which complainant asserted was first secured by Mr. Warner in the annunciator drop of the patent in suit.

The complainant, however, endeavored to overcome such an admission by pointing out that this early annunciator drop and the knowledge of the peculiar properties of the tubular magnet disclosed in this British patent antedated the invention of the telephone, and in consequence could not have been applied to telephone circuits by the inventor.

The Faulkner patent also shows another form of signaling device, having the pivoted armature and tubular magnet now so commonly employed in telephone annunciators, although it lacks the armature lever and shutter drop of the latter structures.

One curious point brought out in the taking of the testimony of Mr. Warner, the inventor, was that previous to the conception of his invention he had worked upon magnetic shields for preventing the magnetization of watch movements.

The defendants' proofs showed also the use of these magnetic shields completely incasing the watch movements and sheltering them from magnetic and electric action, as stated in the patent to Giles, 289,642, dated December 4, 1883. It was urged, therefore, by the defendants that it was a simple and obvious step to protect in the same manner magnet windings which were likely to be subjected to disturbing magnetic influences.

A few additional references produced by the defendants at the trial may also be briefly referred to. One was Section 129 of "The Telephone," by Preece & Maier, which previously was referred to in the suits upon the "Carty Bridging Bell Patent"; this publication describing the use in the telephone system of the British postoffice of indicators, each having an iron casing surrounding their windings.

Another patent discussed was that to Shelbourne, 342,-881, dated June 1, 1886, describing an induction telephone repeater, the windings of which are completely surrounded by an inclosing casing of soft iron and closely fitting top and bottom plates of the same material. This patent very explicitly speaks of the function of the inclosing casing thus formed, which serves to catch and retain the lines of magnetic force that otherwise would diverge from the windings of the repeating coil.

Two apparently conflicting theories were respectively advanced by complainant's and defendants' experts in explanation of the operation of the device of the patent in suit.

Mr. McBerty, the complainant's expert, attributed it to the electrical conductivity of the tubular shell of soft iron, while Mr. Dunbar, testifying for the defendants, asserted that the result sprang from the magnetic properties of the shield, being inherent in any tubular magnet of the prior art, unless precautions were taken for preventing such shielding action.

At the trial a number of tests were made by defendants, which were believed to disprove the theory of complainant's expert and indicate as well the capacity of certain devices of the prior art for accomplishing the same result as was sought to be attained by the patentee in the structure of his claim 1.

Judge Wing's opinion is brief and to the point, and will be read with interest by the readers of TELEPHONY. We quote below the opinion in full:

IN THE CIRCUIT COURT OF THE UNITED STATES, FOR THE NORTHERN DISTRICT OF OHIO, EASTERN DIVISION. Western Electric Company, Complainant, v. The North Electric Company, et al., Defendants.

OPINION OF THE COURT.

The proofs in this case disclose that electric annunciators were well known in the art prior to the date of the patent in suit. The fundamental operative parts of these electro-magnetic annunciators were a coil of wire around an iron core, with a pole piece and armature. By the movement of the armature, a catch was operated which released the drop, by which it was indicated that something had been

done to permit an electric current to pass over the coil of wires forming a part of the device.

This well-known mechanism was used in various arts, not only as an indicator, but as a means of applying force. Early in the history of telephony, it was used to indicate, at the central exchange, that a subscriber desired to communicate.

The patent to Warner, of October 24, 1882, describes such a device. Before that time, such a device to be used for actuating electric bells and indicators, telegraph sounders, Morse instruments, semaphore signals, etc., is shown by the English patent to Faulkner, of May 14, 1875.

On June 17, 1889, Warner applied for the patent in suit. In the specifications, it is said by the applicant, "My invention relates to electric annunciators of the class *usually employed* as individual signaling devices in telephone exchange systems." His object, as expressed, was, firstly, to prevent, as far as possible, inductive effects between the coils of the different magnets when placed near each other; and lastly, to provide for carrying out the ends of the wires of the coil of each annunciator to separate connecting pieces at the rear, so that they might be readily accessible. Further, it is said in the specifications, "Annunciators thus constructed are especially designed to be used in close proximity one to another, and are found to be more sensitive and reliable, and more convenient for connection of the wires, than any heretofore used; magnetic induction between the cores being prevented by the soft iron shields which are placed over the different coils."

Several patents show the use of iron cases around the coil of such a magnet, prior to 1886; notably, the patent to Faulkner, above referred to.

It has been urged on behalf of the complainant, that Warner was the first to discover that use of such an iron casing would prevent the commingling of conversations held on differently connected wires through the exchange, commonly known in telephony as "cross talk." Nothing in the specifications of Warner's patent discloses that he had any such knowledge, or that he proposed to use the soft iron shield for any other purpose than to prevent magnetic induction, and thus render the device more sensitive.

The combination described in Claim One lacks novelty.

Claim Four relates to the openings in the armature through which the ends of the wire of the helix may be carried, so as to connect with the insulated connecting pieces supported upon a frame at the rear. If this claim can be sustained at all, it must be held to cover only the specific mechanism described.

The patentee, in fulfillment of the object of his invention last named by him, describes the device as follows:

"The frame or fork *f* is secured as shown to the shield *c*, its arms or prongs extending backward and serving as a support for the block of rubber *g*, upon which are mounted the connecting pieces *h i*. The wires *k* forming the terminals or ends of the helix are carried back through the armature *d* and connected as shown respectively with contact pieces *h* and *i*."

No change in the operation of the device was effected by thus leading the wires of the helix through the armature. Nothing was accomplished, except, possibly, greater convenience in attachment.

The device used by the defendants has not the frame work *g*, nor are the wires carried back through the apertures of the armature, so as to be connected with the connecting pieces supported upon a frame.

I hold, therefore, that the defendants have not infringed the fourth claim of the complainant's patent.

The bill is dismissed, with judgment for costs against the complainant.

Combined Telephone, Telegraph, Electric Light and Power System.*

Mr. Alexander McMartin Stark, superintendent in Toronto for the Bell Telephone Company, has patented a novel system by means of which a subscriber is furnished with electric light, power and communication over the same circuit at the same time. In carrying out the purpose of the invention Mr. Stark uses a power current transmitted over a main power circuit and distributed at each subscriber's station to the subscriber's main circuit to furnish him continuously with current for his lamps, motors and communication instruments and maintain this power current at constant tension by storage battery bridged across the main power circuit between the generator and subscriber's station, says the Canadian Electrical News. The accompanying drawing represents a diagrammatic view of a complete system of distribution.

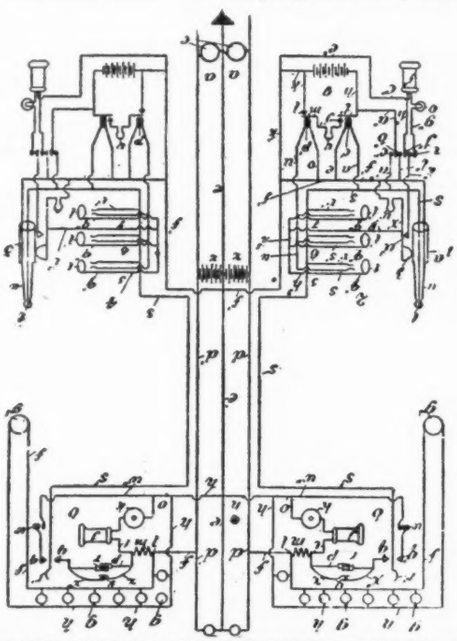


FIG. I—TRANSPOSITION AND RELATIVE LOCATION OF POWER AND TELEPHONE WIRES.

In the drawing *a* is the generator station, which may contain any number of switchboards, and *b b'*, the subscriber's stations. Connecting the generator station with the subscriber's station is a three-wire circuit consisting of two main-conductor wires *d d'* and a main return wire *e*. Tapping the main-conductor wire *d* and leading to the subscriber's station *b* is the subscriber's conductor wire *f*, in circuit, by means of the subscriber's return wire *h* with the main return wire *e*. Connected in parallel with the subscriber's conductor and return wires are a series of lamps *g* and a motor g^5. The electric current continuously circuits over the main-conductor wire *d* to the subscriber's conductor wire *f*, through the lamps *g*, subscriber's return wire *h*, to the main return wire *e*. Tapping the subscriber's conductor wire *f* is the telephone conductor wire *i*, leading to the telephone receiver *j*, in circuit with the telephone transmitter *k*, which is connected with the subscriber's return wire *h* by the telephone return wire *o* and interposed in the circuit between tap *l* and receiver *j* is a resistance *m*. The telephone hook *r'* is connected to the line wire *s*, leading to the tip *t* of the plug *u*, and connected to the line wire *s* is the conductor wire *a'* of the signal-lamp relay *c'*.

The subscriber's signaling device *w* is tapped on the subscriber's return wire *h* by the wire *w''*, and when the receiver is on the hook *r'* the circuit for the current is established over the line wire *s* from the central station through the hook *r'*, contact point *q*, subscriber's signaling device *w* and wire *w''* to the main return wire *e*. Connected with the condenser conductor wire *p* are the wires *x* and *x''*, forming the telegraph circuit, in which is interposed the usual telegraph instruments *y*. Interposed on the condenser conductor wire *p*, between the telegraph-circuit wires *x* and *x''*, is a condenser *r*, the purpose of which is to prevent the interrupted current of the telegraph instrument being trans-

*From the Canadian Electrical News.

mitted to the receiver of the telephone instrument. When the receiver has been removed from the telephone hook r', the circuit from the central station is from the tip t of the plug u, line wire s, telephone hook r^1, contact point q, condenser conductor wire p, telephone conductor wire i, receiver j and transmitter k to the telephone wire o and main return wire e, and, also, over the telegraph circuit, the telegraphic messages being received and transmitted over the telephone circuit when the telephone hook is in this position. A similar system of circuits is installed in the subscriber's station b'.

Bridged on the main power circuit is a storage battery z to aid in maintaining constant pressure of the current as it circuits from the generator to the subscriber's stations and to remove the effects of the imperfect commutation of the generator and destroy the individual vibrations of the current by a neutralization of the same. At the subscriber's stations the current continuously passes over the subscriber's conductor wire f, through the electric lamps g and motor g^5, to the return wire h and main return wire e. The current through the lamps and motor is not interrupted to any noticeable or appreciable extent by the cutting in of the telephone or telegraph instruments, or, in other words, the

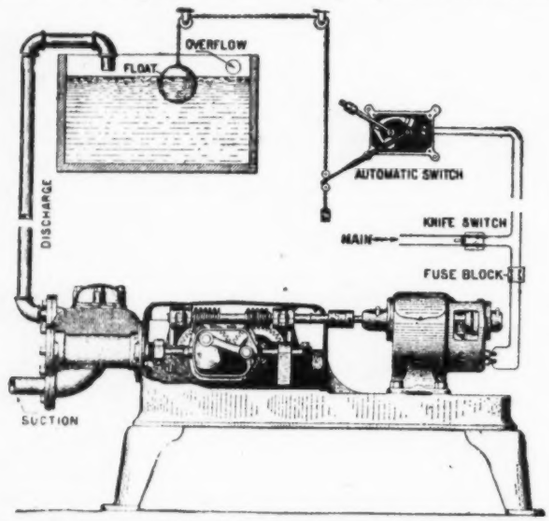


FIG. 2—TRANSPOSITION AND RELATIVE LOCATION OF POWER AND TELEPHONE WIRES.

circuit of the current from the generator through the lamps and motors is continuous and of a sufficiently high potential to perform the work required of it. At the tap l sufficient current is taken off the power circuit to operate the telephone and telegraph instruments and passes through a resistance m to protect the telephone and telegraph instruments against its high potential. The current circuits continuously from the resistance m through the telephone conductor wire i, receiver j, transmitter k, telephone return wire o, to the main wire e. In the case of the telephone, the circuit of the current is constant through the instruments, while in the case of the telegraph instrument, the circuit of the current is interrupted until the telephone hook r' engages the contact point q.

Assuming that subscriber's station b desires to communicate with subscriber's station b', the receiver is removed from the telephone hook r', when a circuit from the generator a is established over the subscriber's conductor wire f, resistance m, condenser and telegraph circuits to the contact point q, hook r', and line wire s to the signal lamp v. The operator at the central station, after the lighting of the signal lamp, brings the contact points i'' j'' into engagement with the contact points of the branch wires k'' l'', respectively, forming a circuit from the line wire s through the operator's instrument at the central station and line return wire f' to the main return wire e, putting the operator's instrument into communication with the instrument at subscriber's station b. The generator current from subscriber's station terminates in the tip t of the plug u, and the operator on being requested to connect subscriber's station b with subscriber's station b', inserts the tip t of the subscriber's plug u into the jack t' of the subscriber's station b'.

On the removal of the receiver from the telephone hook at subscriber's station b' the circuit of the current through the signaling device is broken and is established over the condenser conducting wire and through the condenser to the telephone instrument and also over the telegraphic circuit and then over the telephone return wire to the main return wire e. The subscriber at station b is now in communication with the subscriber at station b', the generator a continuing to furnish the current for the operation of the instruments, as well as for the operation of the lamps and motors at both stations. When the plug 1^a is inserted in the jack 4 the calling subscriber's spring x' moves against the contact point a^3, and establishes a circuit from the generator a over the line wire s through the disconnect lamp w', to the line return wire f', the spring x' and contact point a^3, forming part of the plug switch. When the generator circuit from the subscriber's station b is broken by the receiver being hung on the telephone hook r' at subscriber's station b, the circuit through the disconnect lamp w' is broken and the operator is signaled that the instruments are no longer in use, and the plug 1^a is then disconnected from the jack 4 and returned to its socket.

A MEASURE SERVICE DEVICE.

The effects of trade journal education are seen in one line by the growth in the way of measured service in our Independent telephone exchanges. This has produced a demand for measuring devices, which has been met by the coin collector and by registers not using the coin collecting feature, which may be noted in the advertisements of the Chicago Pay Station Company. This company is now offering a compact little register counting up to 100,000 and giving a clear cathedral-gong signal when each message is registered. A novel feature is that the register is operated by a detachable key which may be carried in the pocket of the telephone subscriber to prevent the use of the telephone by unauthorized persons, thus making a public telephone practically a private one as far as discrimination against the casual caller is concerned.

The party line was the earliest solution of the necessity for cheap telephones, but the party line has not been found a success as is shown by the general use in Independent telephone exchanges of individual lines for all telephones. With the message register, however, the party line seems to be favorable for light traffic telephones, particularly when the register is used in connection with some of the very excellent selective signal devices now on the market. The Chicago Pay Station Co. has a page of facts and figures on the subject of message register and party lines which will be sent on request to the company at its office, 26 Kingsbury street, Chicago.

DEATH OF O. W. FIRKINS.

O. W. Firkins, the well-known cedar dealer, while in Idaho recently met with an accident from which death resulted. He was standing in front of a lath machine being run by a green hand, when a piece of lumber was thrown from the rollers with great force, striking him and causing internal injuries. Mr. Firkins was well and favorably known in lumber circles. He leaves a daughter, who will continue the business started and built up by her father.